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SPAWAR
Systems Center
San Diego

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PREFACE

The Space and Naval Warfare Systems Center San Diego (SSC San Diego) Command History for calendar year (CY) 2006 is submitted in conformance with OPNAVINST 5750.12J. The history provides a permanent record of CY 2006 activities at SSC San Diego. Although the history covers one calendar year, much of the information was only available on a fiscal year (FY) basis and is so noted in the text. In addition, some CY 2005 accomplishments were received too late for inclusion in the CY 2005 history and are included here; these are noted in the text.

This Command History is divided into three main sections. The first section is a general introduction to SSC San Diego. The second section describes administrative highlights. The third section documents technical highlights.

Appendices to this document provide supplementary SSC San Diego information. Appendix A lists achievement awards given in CY 2006. Appendix B lists patents awarded in CY 2006. Appendices C and D provide lists of distinguished visitors hosted by SSC San Diego and major conferences and meetings at SSC San Diego, respectively. Appendix E lists acronyms used in the document.

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SECTION 1
INTRODUCTION

INTRODUCTION TO SSC SAN DIEGO

The Space and Naval Warfare Systems Center San Diego (SSC San Diego) is a full-spectrum research, development, test and evaluation, engineering and fleet support center serving the U.S. Navy, Marine Corps, and other Department of Defense and national sponsors within its mission, leadership assignments, and prescribed functions. SSC San Diego reports directly to the Commander, Space and Naval Warfare Systems Command (SPAWAR).

MISSION

SSC San Diego's formal mission is "to be the Navy's full-spectrum research, development, test and evaluation, engineering and fleet support center for command, control and communication systems and ocean surveillance and the integration of those systems which overarch multiplatforms."

LEADERSHIP AND TECHNOLOGY AREAS

Consistent with its mission, eight leadership areas are formally assigned to SSC San Diego. These leadership areas represent SSC San Diego's command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) charter and its leadership areas outside that scope—ocean engineering and marine mammals. Beyond these areas, SSC San Diego has demonstrated national and international expertise in a broad range of technology areas.

ASSIGNED LEADERSHIP AREAS

- Command, control, and communication (C3) systems
- Command, control, and communication systems countermeasures
- Ocean surveillance systems
- Command, control, and communication modeling and analysis
- Ocean engineering
- Navigation systems and techniques
- Marine mammals
- Integration of space communication and surveillance systems

TECHNOLOGY AREAS

- Ocean and littoral surveillance
- Microelectronics
- Communications and networking
- Topside design/antennas
- Command systems
- Computer technology
- Navigation and aircraft C3
- Intelligence/surveillance/reconnaissance sensors
- Atmospheric effects assessment
- Marine mammals
- Environmental quality technology/assessment
- Robotics

VISION

SSC San Diego's vision was revised in CY 2006: "SSC San Diego will be the DoD Center of Excellence for Integrated C4ISR in the Maritime Domain across the Full Life Cycle (RDAT&E)"

PROGRAMS

SSC San Diego conducts a broad range of programs that focus on integrated C4ISR. The Center also conducts several unique programs outside its primary C4ISR focus: Environmental Quality Technology/ Assessment, Marine Resources, Marine Mammals, Ocean Engineering, and Robotics and Physical Security. Innovative research is encouraged through the In-House Laboratory Independent Research and Independent Applied Research programs.

ORGANIZATION

Figure 1 shows SSC San Diego's organization as of 31 December 2006.

Pacific C4ISR Department[1]

Effective 19 February 2006, SPAWAR Systems Activity Pacific (Code 290) became the Pacific Command, Control, Communications Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) Department (Code 250). Code 250 was created by disestablishing Code 290 and merging it with C4I Programs Hawaii (Code 2424). The new code will carry out scientific and technology programs, as well as engineering and development efforts, with an emphasis on current and projected Department of Defense C4ISR initiatives.
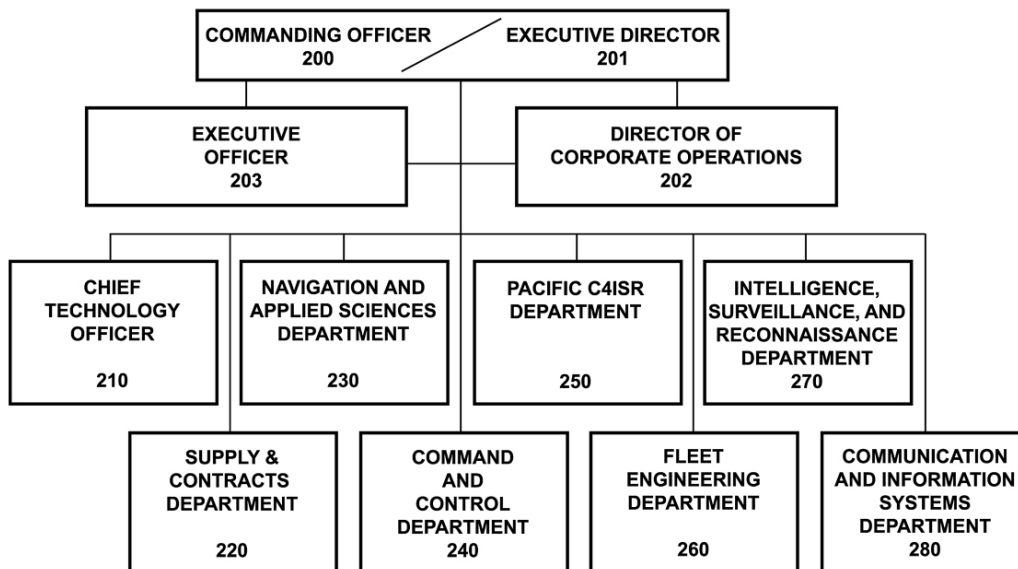
Figure 1. SSC San Diego organization.

SECTION 2
ADMINISTRATIVE
HIGHLIGHTS

FUNDING

FINANCIAL HIGHLIGHTS[2]

Total Funding

- 1.470B (actual) vs. $1.381B (Office of the Secretary of Defense [OSD] budget)
- Increase of $84M over FY 2005
- Reimbursable: $1282M (an increase of $22M over FY 2005)
- Direct Cite: $188M (an increase of $62M over FY 2005)

Carryover

- Target Met (Ceiling, $519M; Actual, $478M)

Funding by Sponsor and Type

Table 1 shows funding by sponsor in FY 2005 and FY 2006. The largest funding increase in FY 2006 was from SPAWAR.

Table 2 shows funding by type in FY 2005 and FY 2006. The largest portion of non-DoD funding in FY 2006 was Homeland Security, $43M.

Table 1. Funding by sponsor, FY 2005 and FY 2006.

Sponsor		$M	
		FY 2005	FY 2006
SPAWAR		505	547
Defense Advanced Research Projects Agency		145	137
Other Navy		247	277
Other (includes Army and Air Force)		240	277
Office of Naval Research		70	58
Naval Air Systems Command		83	79
Naval Sea Systems Command		96	95
	Total	**1386**	**1470**

Note: Largest FY 2006 funding increase from SPAWAR

Table 2. Funding by type, FY 2005 and 2006.

Type	$M (% of Total)	
	FY 2005	FY 2006
RDT&E	535	518
Other Procurement, Navy	351	391
Operations and Maintenance, Navy	277	290
Other DoD[1]	173	202
Other Navy	1	4
Non-DoD	49	65
Total	**1386**	**1470**

Note: The largest portion of non-DoD funding in FY 2006 was Homeland Security, $43M.

PERSONNEL

PERSONNEL ONBOARD

Total personnel onboard as of 31 December 2006 was 3797 (3703 civilian, 94 military). Table 4 lists number of personnel by title.

Table 3. Personnel onboard, as of 31 December 2006.

Scientists and Engineers	2039
Technicians	408
Technical Specialists	497
Administrative	470
Clerical	274
Senior Executive Service	6
Wage Grade	9
Civilian Total	**3703**
Officers	53
Enlisted	41
Military Total	**94**
Total Personnel	**3797**

MAJOR PERSONNEL CHANGES/HIRING

Executive Officer[3]

SSC San Diego Executive Officer Capt. Mark Kohlheim transferred to SPAWAR to serve as Executive Assistant to the Commander SPAWAR, Rear Adm. Mike Bachmann. Capt. Kohlheim had served as the Executive Officer since August 2005.

Public Affairs Officer/Director of Strategic Communications and Public Affairs[4,5]

Tom LaPuzza retired 1 June 2006 after 18 years as the Center's Public Affairs Officer (PAO). As PAO, his primary responsibilities included serving as the command spokesperson for the news media and general public and serving as the spokesperson for the Navy Marine Mammal Program.

Retired Navy Commander Jim Fallin was selected to be SSC San Diego's Director of Strategic Communications and Public Affairs (title changed from Public Affairs Officer). Prior to his selection, Fallin served as Director of Public Affairs and Program Manager for Marketing and Community Programs at Los Alamos National Laboratory in Los Alamos, New Mexico.

Head, Pacific C4ISR Department[6]

George McCarty was selected to head the Pacific C4ISR Department. Prior to his selection, McCarty was Science Advisor to Commander, Submarine Force, U.S. Pacific Fleet.

Head, Intelligence, Surveillance, and Reconnaissance (ISR) Department[7]

Pat Sullivan was selected to head the Intelligence, Surveillance, and Reconnaissance (ISR) Department (Code 270). Prior to his selection, Sullivan was head of the Joint and National Systems Division, responsible for research, development, and production of joint and national intelligence collection, dissemination, and exploitation systems.

Head, Supply and Contracts Department[8]

Tammy Sanchez joined SSC San Diego in June as head of the Supply and Contracts Department, Code 220. Sanchez previously served as deputy director of the Regional Contracting Department at the Fleet and Industrial Supply Center (FISC), San Diego, where she managed more than 100 people who provided acquisition support to over 300 Navy ashore and afloat activities throughout the Southwestern Region of the U.S.

Director of Security[9]

Rita D. Mireles was selected as the new SSC San Diego Director of Security (Code 2035). Mireles previously headed the Information and Personnel Security Branch, Code 20351.

New Professional Program

The Center hired 68 New Professionals in FY 2006, a decrease from FY 2005 (73).

BASE CLOSURE AND REALIGNMENT (BRAC)[10]

Due to Department of the Navy budgetary constraints, the execution plan was postponed until associated financial issues were resolved. The Center has been actively engaged in developing a plan for executing BRAC recommendations since BRAC became law on 9 November 2005. BRAC 2005 recommended the realignment of two organizations with SSC San Diego: Navy Center for Tactical Systems Interoperability (NCTSI) and San Diego Detachment of SSC Norfolk. The following represents the status (as of February 2006) of the Center's BRAC execution plan:

- Realignment of Navy Center for Tactical Systems Interoperability (NCTSI) and SSC Norfolk San Diego Detachment into the Center is projected to occur in FY 2009.

- Relocation of maritime undersea sensors to Naval Undersea Warfare Center Newport and maritime surface sensors to Naval Surface Warfare Center Dahlgren will likely occur in FY 2011 (or FY 2010) since military construction at both locations needs to be completed prior to relocation. Construction cannot start until FY 09 due to the budget.

- Realignment of designated SSC San Diego personnel in Tidewater to SSC Atlantic is projected to occur in FY 09.

Update (announced January 2007)[11]: The Team SPAWAR leadership met in Norfolk in November 2006 and a standup date for SSC Pacific and SSC Atlantic was established as 1 October 2008 (beginning of FY 2009). At that time, SSC San Diego's name will officially change to SSC Pacific. The SSC Norfolk San Diego Detachment and the Naval Center for Tactical Systems Interoperability (NCTSI) will join the Center. The realignment of designated SSC San Diego personnel in Tidewater to SSC Atlantic will also occur at the beginning of FY 2009. The relocation of maritime undersea sensors to the Naval Undersea Warfare Center Newport and maritime surface sensors to the Naval Surface Warfare Center Dahlgren is scheduled for FY 2011.

2006 ORGANIZATIONAL ASSESSMENT SURVEY[12]

Results of the 2006 Organizational Survey, conducted 13 February through 6 March, were made available to Center employees in June 2006. The survey was administered to all employees (3700), 2292 employees completed the survey. SSC San Diego had the highest response rate ever (63 percent). Favorable responses went up in every workforce dimension, over and above the positive results in 2004 and 2002. The OAS assessed organizational *climate and culture* on 17 high-performance dimensions.

In summary, SSC San Diego

  has a positive climate
- The majority of employees have favorable attitudes
- On all but one dimension, less than 25% have unfavorable attitudes
- Lowest and highest scores tend to be lowest and highest government-wide

  continues to improve
- 13 dimensions are higher than in 2004, and all are higher than in 2002
- But improvements are generally small

  scores better than most government agencies
- 14 dimensions are above the benchmark median
- Notable exception for Work Environment

  scores relatively high on High Impact dimensions
- 3 are in the Top 5
- 3 are in the Bottom 5

STRATEGIC PLANNING AND INITIATIVES

SSC SAN DIEGO STEERING COMMITTEE CHARTER[13]

The SSC San Diego Steering Committee Charter was signed by SSC San Diego Executive Director Carmela Keeney on 25 October 2006. This committee was formed by Director of Corporate Operations to reduce roadblocks and time delays that occur in developing and implementing solutions for Center-level requirements. The committee is made up of department head representatives as well as the Comptroller, Executive Officer, and Director of Corporate Operations. These representatives review requests for Center-level needs.

The Steering Committee members discuss the requests with their departments and recommend an appropriate course of action. This may include directing the request to a Center-level committee for further analysis or resolution, providing financial resources for further analysis, approval of the implementation plan, development of a communication/feedback plan, or deferring the resolution to a later date.

The Steering Committee reviews and prioritizes requests based on whether they might improve cost, performance, schedule, or morale. Other factors that are considered include whether the request falls within the control of the Center, affects more than one department or group, or is aligned with the Center's strategic goals.

The Steering Committee Coordinator receives and maintains a list of requests that have been submitted. This list includes where the request originated, what action the Steering Committee took, and the weekly progress towards resolution. Status of initiative requests will be briefed to the Corporate Board on a regular basis. Increased awareness of active Center-level efforts and the quick identification of delays will speed up implementing process improvements.

The Steering Committee has also embarked on a challenge to review and approve the charters of all Center-level committees at SSC San Diego. There are an estimated 30 to 40 groups, boards, Integrated Product Teams, etc. The goal is to task these committees to support high-priority Center initiatives and needs, and to remove overlap of work efforts.

CORPORATE OPERATIONS

ADMINISTRATIVE HIGHLIGHTS[14]

- Completed extensive paperwork to obtain an Authority to Operate for Facility Cost Transfer, Standard Invoice Loading and Tracking, and the Corporate Database suite.
- Completed Navy Marine Corps Intranet (NMCI) seat reconciliation to facilitate an error-free technical refresh of existing NMCI seats.
- Completed RDT&E network infrastructure upgrade to provide an ability to shut down individual ports for a dramatic increase in overall network security.
- Completed a Computer Center "conditioned" power upgrade that increased the capacity to maintain the network during unexpected power outages and protect the power sensitive electrical equipment.
- Developed five Web-based, computer-based training packages for the Legal Counsel and the Director of Corporate Operations.
- Upgraded Enterprise Resource Planning (ERP) configuration for addressing funds management posting problems to convert existing accounting data into Navy ERP format.
- Project Cabrillo was cited for the positive contributions to the Navy ERP effort.
- Obtained approval to upgrade Business Warehouse to better support conversion of that data to the Navy ERP format.
- Conducted process improvement classes to initiate and achieve best practices. (See "Process Improvement" below for discussion.)

PROCESS IMPROVEMENT

Mastering Process Improvement Class[15]

SSC San Diego's Systems Engineering Process Office (SEPO), Code 20203, hosted a class entitled Mastering Process Improvement from 21 to 25 August. Course presenters were representatives from the Software Engineering Institute at Carnegie-Mellon University.

The comprehensive 5-day course provided an overview of techniques for initiating and successfully achieving Best Practice implementation. It introduced a Process Change Model that described the stages of Process Improvement (PI):

- Organize and prepare for PI
- Conduct an organization scan
- Establish technical working groups
- Understand projects' current states
- Redesign processes
- Develop whole product solutions
- Conduct pilots and evaluations
- Facilitate organizational learning

The MPI course was provided to kick-start the Center's PI initiative and help recently identified division projects achieve Capability Maturity Model Integration Maturity Level 2.

The 24 attendees included department systems/Software Process Improvement (SPI) agents, project managers, project SPI leads, project team personnel, and representatives from SEPO. Additional insights were provided on the Center's existing PI infrastructure, process assets, the SSC San Diego Process Asset

Library (PAL), and the Center's PI implementation strategy. Exercises conducted during the training were based on actual Center-documented plans, adding relevance to the course.

Process Improvement Training[16]

SEPO representatives and the Code 250 Department Systems Process Improvement (SPI) agent provided process improvement training in Yokosuka, Japan. Twenty department managers and project managers of the Pacific Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) Department (Code 250) participated in the courses. The courses included "Introduction to Best Practices," "Peer Reviews," "Guidelines for Successful Teams," and "Lean Six Sigma Orientation." The Code 250 department managers and project managers primarily represented shore and fleet installations. They were consulted to identify best practices and set improvement objectives in keeping with the Executive Director's guidance concerning department SPI objectives.

COMMUNITY OUTREACH

COMMUNITY OUTREACH HIGHLIGHTS

- Held an open house to celebrate the history of Navy science and technology on Point Loma. (See "Center Open House" below for discussion.)
- Presented an historical exhibit at Point Loma/Hervey Branch Library. (See "Historical Exhibit at Point Loma Library" below for discussion.)
- Hosted Ninth International Autonomous Underwater Vehicle (AUV) Competition. (See AUV Competition article below for discussion.)
- Participated in the 2006 San Diego County Educational Technology Fair (See Technology Fair article below for discussion.)
- Hosted Mathematics, Engineering, and Science Achievement (MESA) Shadow Day. (See MESA Shadow Day article below for discussion.)

CENTER OPEN HOUSE[17]

On 20 May 2006, the Center held an open house for family members and friends to celebrate the history of Navy science and technology on Point Loma. The first open house in two decades, the event coincided with the 100th Anniversary of the Navy Radio Station Pt. Loma, which was established 12 May 1906, and with the 66th Anniversary of the U.S. Navy Radio and Sound Laboratory, which was established 1 June 1940. SSC San Diego traces its heritage directly to the Radio and Sound Laboratory.

HISTORICAL EXHIBIT AT POINT LOMA LIBRARY[18]

During August 2006, SSC San Diego presented an historical exhibit in the Point Loma/Hervey Branch Library. The exhibit, entitled "Historical Perspectives of the Navy on Point Loma," was an outreach effort to familiarize the Center's Point Loma neighbors and the San Diego community with the Navy's historical and cultural contributions. It commemorated 100 years of communications research and development on Point Loma. Current Center technology was also represented. This was the second time SSC San Diego has participated in the Point Loma Library's community display. The first exhibit was in 2003.

NINTH INTERNATIONAL AUTONOMOUS UNDERWATER VEHICLE COMPETITION[19]

The Ninth International Autonomous Underwater Vehicle Competition was held at the Center's Transducer Evaluation Center (TRANSDEC) 3-6 August 2006. The competition consisted of teams of international students from 20 colleges and universities, and one high school. Using unmanned underwater vehicles, the students endeavored to fulfill the competition's three missions: (1) rendezvous with a "docking station," (2) find and mark a break in an underwater pipeline, and (3) home in on an acoustic beacon and breech within a marked surface zone. The competition's final standings were (1) University of Florida, (2) Duke University, (3) Ecole de technologie superieure (Canada), and (4) University of Rhode Island.

The event, hosted by SSC San Diego, educates the public, introduces engineering students to SSC San Diego's research and development programs, and serves as an employee recruiting effort. The competition is sponsored by the Association for Unmanned Vehicle Systems International and the Office of Naval Research.

2006 SAN DIEGO COUNTY EDUCATIONAL TECHNOLOGY FAIR[20]

SSC San Diego participated in the 2006 San Diego County Educational Technology Fair held at the Del Mar Fairgrounds. Local companies and government activities provide interactive experiences for approximately 2500 students from the San Diego County high schools and middle schools. Representatives from the Unmanned Systems Branch presented the Center's robotics technology. The goal of the Educational Technology Fair is to promote student interests in math and science that might encourage young people to pursue scientific careers. The fair is a collaborative effort of the San Diego County Office of Education, San Diego City Schools, San Diego congressional delegation, and the Science Alliance, a private foundation.

MATHEMATICS, ENGINEERING, AND SCIENCE ACHIEVEMENT (MESA) SHADOW DAY[21]

SSC San Diego hosted the Mathematics, Engineering, and Science Achievement (MESA) Shadow Day. MESA Shadow Day is a math and science enrichment program that works with urban high school and university students from groups with low eligibility rates for 4-year colleges. It is a program of San Diego State University and the University of California San Diego. The Center Workforce Programs Office is the Center's liaison to the program.

SECTION 3
TECHNICAL HIGHLIGHTS

NAVIGATION AND APPLIED SCIENCES

TECHNICAL HIGHLIGHTS[22]

- The Advanced Global Navigation Simulator Test Station team completed development of a Global Positioning System software-based receiver able to track the recently launched IIR-M satellites.
- Funding was approved to develop and field a Navigation Sensor System Interface System that will meet DDG 1000 platform requirements.
- Provided technical and supply assistance for Marine Air Traffic Control and Landing Systems used by expeditionary Marine forces deployed at air bases and forward operating bases in Iraq.
- The Electronic Harbor Security System project team designed, planned, installed, and commenced maintenance of anti-terrorism/force protection hardware at five locations including Naval Base San Diego.
- Participated in the acceptance testing of Coast Guard Integrated Anti-Swimmer System (CGIAS) production systems six and seven. (See CGIAS article below for discussion.)
- Participated in sinking of ex-USS *Oriskany* as the world's largest artificial reef by providing required environmental studies. (See "USS *Oriskany*" below for discussion.)
- Continued participation with the Environmental Investment (ENVVEST) Project in Sinclair and Dyes Inlets near Bremerton, Washington, in support of the Puget Sound Naval Shipyard and Intermediate Maintenance Facility. (See "ENVVEST" below for discussion.)
- Robart III ranked as one of "The 50 Best Robots Ever" by *Wired Magazine.* (See "Robart III" below for discussion.)
- Performed a series of collaborative behavior demonstrations involving multiple unmanned autonomous systems in a force-protection scenario. (See "Unmanned Systems Demonstration" below for discussion.)

COAST GUARD INTEGRATED ANTI-SWIMMER SYSTEM (CGIAS)[23]

SSC San Diego personnel participated in the acceptance testing of Coast Guard Integrated Anti-Swimmer System (CGIAS) production systems six and seven; the systems successfully passed acceptance tests. The systems will be used by U.S. Coast Guard (USCG) Maritime Safety and Security Teams.

Developing anti-swimmer systems for USCG harbor protection is a challenge. A harbor environment is typically noisy, shallow, and has low, or no, visibility. Additionally, the system must be transportable, rapidly deployable, easy to setup, and easily used in all areas under USCG purview. To meet the challenges, the Advanced Systems and Applied Sciences Division has designed and fielded two Integrated Anti-Swimmer Systems (IAS). Currently, two USCG Maritime Safety and Security teams are fielding the flyaway systems.

Each IAS system provides swimmer/diver detection using a commercial-off-the-shelf sonar and an Advanced Capability Processor (ADCAP). The ADCAP is the result of a joint effort by the University of Texas' Applied Research Laboratory and SSC San Diego. Along with detection, the ADCAP processor provides sonar target tracking and classification.

The IAS provides situational awareness through the Command, Control, Communications and Display (C3D) processor. Watch standers use C3D to orchestrate the entire response evolution. C3D cues the operator to a potential threat via an audio alarm. The operator can then train cameras to the alarm location or send a patrol vessel to the target's location for further investigation. All tracks, sonar video, and blue

force tracking/vectoring are controlled with a few mouse clicks. Sonar contacts and patrol boat locations are simply overlaid on a geo-referenced chart or aerial photograph.

Patrol boats using IAS carry a tracking package that is connected back to the C3D via a radio frequency link. The link exchanges Global Positioning System, compass, and target information from shore control to one or several patrol vessels. Using rapid update rates, coxswains receive real-time intercept solutions that are presented to them on a personal digital assistant.

The USCG's Underwater Port Security Working Group reviews ongoing efforts and provides direction to the USCG and the Department of Homeland Security in the area of subsurface and swimmer threats. Of particular interest is a capability to detect, track, locate, identify, and respond to potentially hostile swimmers and divers. The IAS System is a direct descendent of the Navy's Waterside Physical Security and the Defense Threat Reduction Agency's 6.2 Security Vehicle with Acoustic Guidance projects.

USS *ORISKANY* [24]

USS *Oriskany* (CVA 34) was sunk as the world's largest artificial reef on 17 May 2006, approximately 23 miles south of Pensacola, FL. SSC San Diego personnel provided the required environmental study and documentation for the approval from the Environmental Protection Agency (EPA) to sink the vessel as an artificial reef, helping to ensure the project's success. The reef will benefit marine life, commercial and sport fishing, and recreational diving.

The Navy sought a risk-based disposal approval that would allow the sinking of *Oriskany* as an artificial reef with approximately 700 pounds of polychlorinated biphenyls (PCBs) in solid material onboard. The technical issues related to the challenges and costs associated with removing all solid matrixed PCB containing materials equal to or greater than 50 parts per million. The SSC San Diego team was responsible for completion of all of the Navy's technical documentation for the risk-based disposal application to sink *Oriskany*.

The biggest concern is that sunken ships could leach PCBs or other contaminants to impact ecological resources. To assess potential contamination risk, a screening level ecological risk assessment was conducted using data from an artificial reef associated with an ex-warship located off the coast of South Carolina (ex-USS *Vermillion*). Contaminants of concern can enter the environment from releases from this type of sunken vessel or inputs from coastal waters.

The REEFEX team developed benchmarks for water, sediment, tissue residue, and dietary exposures for comparison with estimates of potential contaminants associated with *Vermillion*. Additionally, estimates of exposure associated with *Vermillion* were compared to estimates of exposure associated with other artificial reefs, natural reefs, and regional background. At the same time, pieces of material containing PCBs were obtained from vessels being decommissioned and were used in an experiment to empirically determine the rate of PCB release in a laboratory environment simulating a shallow water reef. A model was then developed using laboratory release rate values to model expected concentrations of PCBs in water, sediment and other abiotic compartments of the environment inside and surrounding a vessel for the first 2 years after a ship is sunk. The results of the *Vermillion* studies were applied to the documentation[25] for the sinking of *Oriskany*. The overall technical effort was integrated with the development of a second model (the Prospective Risk Assessment Model) and a separate human health risk assessment.

The issuance of the reefing approval was subject to a favorable consultation by the EPA's Science Advisory Board and a review of the results by EPA Region 4 and the EPA Office of Research and Development. Approval was issued by the EPA's Region 4 office in February 2006.

ENVIRONMENTAL INVESTMENT (ENVVEST) PROJECT[26]

Note: Events discussed here occurred in 2004 and 2005.

Environmental Sciences and Applied Systems Branch (Code 2375) personnel are supporting the Environmental Investment (ENVVEST) Project in Sinclair and Dyes Inlets near Bremerton, Washington. Project ENVVEST is a cooperative partnership of the Navy, regulatory agencies, and the public that seeks to develop and demonstrate alternative strategies for protecting and improving the ecological integrity of the inlets and surrounding watershed. Project ENVVEST allows environmental protection strategies to focus on the pollutants that have the highest potential to adversely affect the health of the watershed. Key elements include developing a unified monitoring and modeling program with a comprehensive environmental database for the inlets.

SSC San Diego's Marine Environmental Support Office–Northwest Detachment serves as technical coordinator for the Project ENVVEST team in support of the Puget Sound Naval Shipyard and Intermediate Maintenance Facility, the Environmental Protection Agency, the Washington State Department of Ecology, and other local stakeholders. These groups are participating in a partnership to improve the environmental quality of the inlets. Accomplishments include:

- Completing a technical study of bacterial pollution in Sinclair and Dyes Inlets.
- Developing an integrated watershed and receiving a water simulation model for the inlets.
- Assessing contaminant loading to the inlets from storm events and runoff from the watershed.

With the Navy as technical lead, a study was designed and carried out to establish the capacity of the two inlets to accept discharges of fecal coliform (FC) bacteria and still meet water quality standards. The goals of the study were to identify microbial pollution problems within the watershed and provide a comprehensive assessment of bacterial pollution from all identified sources.

The study found numerous sources of bacterial pollution in the watershed that would impact water quality and shellfish harvesting areas. The commercial harvest of shellfish relies on measurements of indicator FC bacteria to determine whether shellfish are safe for consumption.

The ENVVEST team developed an integrated model for the Sinclair and Dyes Inlets watershed capable of simulating runoff from the watershed. The modeling results contributed to the re-opening of shellfish beds in Northern Dyes Inlet to commercial harvesting.

A major effort to sample storm events and conduct ambient monitoring in the inlets was planned and executed by the team for Project ENVVEST during 2004–2005. The team collected samples from streams and stormwater outfalls that were being monitored for flow within the watershed. Samples from the streams and outfalls were analyzed for heavy metals, toxic organic compounds, and nutrients, and screened for the presence of pesticide and herbicide compounds. The data obtained from this sampling effort are being used to develop relationships between water quality and watershed hydrology, land use, and land cover. The study will support further development of the integrated watershed and receiving water models implemented for the Sinclair and Dyes Inlets watershed.

ROBART III[27]

The January 2006 issue of *Wired Magazine* presented a comprehensive survey of "The 50 Best Robots Ever," which included both real and Hollywood-inspired contenders. Featured in the former category was SSC San Diego's ROBART III, ranked number 16 overall, beating out such storied legends as the Terminator, Optimus Prime, and even R2-D2. Already well established as one of the most sophisticated autonomous mobile robots in the world, ROBART III has been featured numerous times on the Learning, History, and Discovery channels since development began here in 1992.

As the third-generation prototype, ROBART III is specifically intended to demonstrate the feasibility of automated response. Specific research thrusts include: (1) enhanced reflexive teleoperation, (2) automated target acquisition and tracking, (3) simultaneous localization and mapping, (4) natural language understanding, and (5) augmented virtuality. There is currently considerable interest in transitioning technology developed under this program to the various man-portable robots currently being used to address the improvised explosive device threat in Iraq and Afghanistan. A natural-language interface, for example, would allow a supervised autonomous robot to be given fairly unstructured verbal direction, no different from the procedures used to instruct a human to perform the same tasks.

UNMANNED SYSTEMS DEMONSTRATION[28]

Note: Accomplishments described here occurred in CY 2005.

In December 2005, the Unmanned Systems Branch (Code 2371) performed a series of collaborative behavior demonstrations involving multiple unmanned autonomous systems in a force-protection scenario. The successful demonstrations included simultaneous control of an unmanned surface vehicle (USV), an unmanned ground vehicle (UGV), and an unmanned aerial vehicle (UAV) using the Multi-Robot Operator Control Unit (MOCU) command and control software.

MOCU was designed to control multiple robots and sensors across air, land, and sea. Its modular architecture scales to any vehicle's requirements such as map, communications protocol, mission planner, and human-interface needs, including gauges, map windows, and video inputs. All three unmanned systems communicated with the MOCU software using the Joint Architecture for Unmanned Systems (JAUS) protocol.

In the simulated threat scenario, two amphibious commandos landed on the beach at Point Loma and infiltrated inland. Their goal was to crest a hill and attack the Submarine Base. Pre-positioned radar and vibration sensors detected the incursion and alarmed the SSC San Diego Robotic Operations Command Center (ROCC). Triggered by unattended ground sensors, the Man-Portable Perimeter Protection system automatically provided confirming video of the two armed intruders heading east.

A Mobile Detection Assessment Response System-Exterior (MDARS-E) vehicle, equipped with an automatic weapon and a UGV marsupial carrier, was dispatched south from the ROCC to intercept the threat on Woodward Road. Patrolling off the coast, the USV was redirected south by the MOCU operator to assess the situation from the sea. With onboard collision-avoidance and path planning capabilities, the USV was able to reroute itself and provide video surveillance of other possible hostile forces in the area.

The MDARS vehicles detected no sign of troop movement on the ground, indicating that possible refuge had been taken in the underground World War II bunker, Battery Woodward. Accordingly, MOCU launched an unmanned helicopter to obtain low-altitude mission-planning imagery and real-time reconnaissance of the incursion area.

Based on the helicopter imagery, MOCU commanded the Urban Robot (URBOT), a man-portable tracked UGV, to approach the north entrance. Once the URBOT was in position, the helicopter relocated to cover the south entrance, while MDARS-E guarded the east entrance on Woodward Road. Upon seeing the helicopter one intruder bolted from the south door and headed east. When this intruder crossed Woodward Road, MDARS successfully engaged with the Networked Remotely Operated Weapon System.

To locate the remaining intruder, an All Terrain Robotic Vehicle (ATRV) was sent via MOCU to the bunker using GPS waypoint navigation. The ATRV seamlessly transitioned to ladar-based simultaneous localization and mapping navigation and entered the north door to autonomously search and map the interior of the bunker, finding a .50-calibre machine gun and the second intruder hiding inside. The

ATRV uploaded a virtual-world model of the bunker fused with screen icons and embedded imagery marking the weapon and intruder locations.

In ongoing work, Code 2371 is pursuing the integration of MOCU with Composeable FORCEnet (CFn). The MOCU will publish status data and provide a live video feed to CFn to enhance battlespace awareness.

COMMAND AND CONTROL

TECHNICAL HIGHLIGHTS[29]

- Performed engineering activities for the National Geospatial and Intelligence Support Agency Deployable System that allowed the Imagery Exploitation Support System and the Image Product Library to be rehosted onto a single set of downsized hardware.
- Joint Program Management Office for Information Systems project team reached Capability Maturity Model Integration (CMMI) Maturity Level 2. (See "Joint Project Manager Information Systems (JPM IS)" below for discussion.)
- Composeable FORCEnet remained key in enabling command and control situational awareness and multi-echelon collaboration for the deployed Navy in the Pacific.
- Continued to play a key role in Ballistic Missile Defense test and evaluation. (See "Aegis Ballistic Missile Defense" below for discussion.)
- Successfully upgraded Range Architecture Adaptable Message Processor (RAAMP). (See RAAMP article below for discussion.)
- Deployed Joint Mission Planning System (JMPS). (See JMPS article below for discussion.)
- Conducted the first operational assessment for Joint Effects Model (JEM). (See JEM article below for discussion.)

JOINT PROJECT MANAGER INFORMATION SYSTEMS (JPM IS)[30]

Two projects of the Joint Project Manager Information Systems (JPM IS) business area of the Command and Control Technology and Experimentation Division (Code 246) achieved Capability Maturity Model Integration (CMMI) Maturity Level 2 on 25 August. Additional appraisal results stated that the team is well on its way to Level 3 implementation. This assessment was based on a Standard CMMI Appraisal Method for Process Improvement (SCAMPI) Class A appraisal led by a Software Engineering Institute (SEI)-authorized lead appraiser from the Software Technology Support Center at Hill Air Force Base.

The two projects evaluated in this appraisal had a combined staff of over 90 personnel. It included the Chemical, Biological, Radiological, and Nuclear (CBRN) Information Systems team and the Software Support Activity (SSA) of the Joint Program Executive Office for Chemical and Biological Defense (JPEO-CBD). This is the largest team at the Center to achieve CMMI Maturity Level 2. It is the second team in Department 240 and third team at the Center to achieve this designation.

The CBRN IS project is responsible to the JPEO-CBD for managing the development of chemical, biological, radiological, and nuclear information systems. These systems are related to warning and reporting, hazard prediction, course of action analysis, and integration with Joint and service-specific command, control, communications, computers, and intelligence. The activities performed by Code 246 CBRN IS personnel include component program engineering services, the conduct of CBRN IS integration management and technical oversight, SSA project team activities, and common services support such as configuration management across the JPM IS program.

The SSA project is a JPEO-CBD user support organization under JPM IS, spanning and supporting all Joint program managers and JPEO-CBD directorates. The SSA provides enterprise-wide services and coordination across all JPEO-CBD Programs of Record that contain data or software, or are capable of linking to the Global Information Grid. SSA activities include ensuring program compliance with acquisition policies, processes, and standards, support of JPMs to minimize time, cost, and process in acquisition management, and the creation and leverage of common standards, protocols, processes,

procedures and services. These enable common design, testing, and fielding tenets for JPEO-CBD systems.

AEGIS BALLISTIC MISSILE DEFENSE

Stellar Predator Campaign[31]

SSC San Diego supported the successful intercept of a target ballistic missile during Flight Test Mission-10 (FTM-10) of the Stellar Predator Campaign. The target missile was launched from the Pacific Missile Range Facility, Barking Sands, Kauai, Hawaii. *USS Shiloh* (CG 67) detected and tracked the target and developed a fire control solution. *Shiloh's* crew then fired an SM-3 missile, successfully intercepting the target warhead outside the earth's atmosphere more than 100 miles above the Pacific Ocean and 250 miles northwest of Kauai. This was the *Shiloh's* first missile defense test using upgrades to its SPY-1 radar and advanced communications system to make it capable of serving as a sea-based missile defense platform. It was also the first time the new weapon system configuration and a new missile configuration were used during the intercept mission.

Three Aegis destroyers also participated in the flight test. One Aegis destroyer, equipped with the latest Next Generation Command and Control Processor (NGC2P), linked with a land-based missile defense radar to evaluate the ability of the ship's missile defense system to receive and use target cueing data via the missile defense Command, Control, Battle Management and Communications (C2BMC) architecture. The BMDS Test Bed, San Diego (BTS) hosted and led the command, control, communications, computers and intelligence (C4I) interoperability for FTM-10 and managed three separate link architectures concurrently from the lab. These architectures supported the intercept, the cue from the land-based radar, cueing among the participating ships, and situational awareness to many shore sites throughout the continental U.S.

Also in support of Aegis BMD ships, the Navigation Sensor System Interface (NAVSSI), developed at SSC San Diego, successfully provided raw Global Positioning System (GPS) data from NAVSSI Fiber Optic Antenna Link to a stand-alone Vertical Launching System GPS Integrator. This enhancement directly supported the SM-3 missile.

Several SSC San Diego laboratories provided support during FTM-10, including the BTS; Systems Integration Facility; Transport, Test, and Integration Complex (TTIC); EHF Land Based Test Facility; and JTT Tactical Terminal Lab.

Missile Defense System Exerciser (MDSE)[32]

SSC San Diego's Tactical Communications Solutions (TCS) missile defense team recently completed a significant and lengthy phase of testing in support of the Missile Defense System Exerciser (MDSE) program. The missile defense events included:

- MDSE Spiral 6.0 (S6.0) tool development testing
- Support of the Patriot Post-Deployment Build 6 Interoperability Demonstration Limited User Test
- Combined Test Force (CTF) Ground Test Experiment 1b
- CTF Integrated Ground Test 01 events

MDSE is a modeling and simulation tool that is used to perform Ballistic Missile Defense System (BMDS) characterization and assessment, interoperability assessment, and element integration assessment between missile defense assets located at development sites across the Continental U.S. The missile defense assets are composed of an integrated set of BMDS elements/components and a test infrastructure widely dispersed among BMDS element hardware-in-the-loop facilities.

Since 1994, SSC San Diego has provided Joint Data Network (JDN) and test and evaluation support for MDSE (originally called Theater Missile Defense System Exerciser). Specifically, SSC San Diego provides the data link gateway as the JDN communications equipment that is used in MDSE to exchange Tactical Digital Information Link (TADIL) J, Satellite TADIL J, and Integrated Broadcast Service data over landlines.

The MDSE program supports testing necessary to meet Missile Defense Agency (MDA)-defined objectives and evolves to continue supporting element characterization and assessment of BMDS Block 04 and beyond.

RANGE ARCHITECTURE ADAPTABLE MESSAGE PROCESSOR (RAAMP)[33]

SSC San Diego provided a Range Architecture Adaptable Message Processor (RAAMP) Phase 1 Tactical Data Information Link (TDL) upgrade to the Pacific Missile Range Facility (PMRF). The RAAMP upgrade includes hardware and software products consisting of emulators, adapters, and converters to form an integrated set of capable solutions and replaces legacy tactical equipment that has become expensive to operate and maintain, excessively unreliable, or no longer available.

Specific interface differences between old and new architectures at PMRF are overcome by installation of the RAAMP equipment and software.

- The existing Model 4 TDL encountered safety and surveillance limitations during training operations when tracking information were exchanged between land-based range controllers and the operational units (air, surface, sub-surface). PMRF needed the Model 5 Common Data Link Management System (CDLMS) to continue fleet training and qualification of U.S. naval forces and national systems with improved safety and surveillance capability. Because of budget and schedule constraints, the existing Advanced Combat Direction System (ACDS) Block 0 was chosen to remain at PMRF as host system to the CDLMS. RAAMP provides the compatible interface between Model 5 CDLMS and Model 4 ACDS Block 0.
- RAAMP uses an existing product line of Tactical Emulator Peripheral Systems (TEPS). The RAAMP software is hosted within TEPS, providing added cost benefits and streamlined development time.

During the summer, the Center provided an engineering demonstration model of RAAMP to support range operations and replace the NTDS Range Interface (NRI) and the Range Interface ACDS Translator (RAIT), which had become too problematic to sustain the primary range training mission. Incorporated into RAAMP are new capabilities not available with the old system for track processing, display, and filtering.

The RAAMP team then conducted the final laboratory simulation tests in preparation for system integration at PMRF. Phase 1 design and implementation was completed on 30 September. Software test plan and product acceptance tests were conducted at PMRF on 2 October. A high-level configuration item baseline version was tested that includes ACDS range interface, ACDS Link-11 interfaces, instrument network interface, and the CDLMS host interface.

The tests will directly evaluate all software functions and indirectly provide an additional level of confidence that the system hardware and software will satisfy their intended purpose. Successful test completion will validate the RAAMP Phase 1 TDL Upgrade installation at PMRF.

JOINT MISSION PLANNING SYSTEM (JMPS)

Royal Australian Air Force F-18[34]

The Joint Mission Planning Support Office (Code 24234) deployed a new mission planning computer system and provided on-site training for three Royal Australian Air Force F-18 squadrons from 26 June to 11 July. This culminated over 3 years of work for the office and its personnel. The new laptop computers and the residing Microsoft-based Joint Mission Planning System (JMPS) software replaced a large, cumbersome UNIX system for creating, formatting, and downloading mission planning data into the Australian F-18 aircraft. The new computer system standardizes processes and procedures.

Australia is the first of five coalition nations to receive the new JMPS software. The other nations scheduled to field JMPS systems are Canada, Italy, Spain, and Taiwan. These nations are in various stages of implementation. The JMPS International Program is a growing venture, and other nations are considering the use of the JMPS software as their mission planning system of choice. This is not only for the F-18 but for other aircraft types such as E-2, AV-8, and some helicopter platforms.

Personnel from SSC San Diego Philadelphia Detachment played a critical role in the Australian evolution by developing the Joint Simplified Installation Methodology software, writing the software manuals, procuring the hardware from a commercial vendor, loading the computer systems with various component software, and conducting training to three Australian F-18 squadrons at two locations. Four technical trainers provided over 60 hours of hands-on training to 30 personnel.

The whole evolution was accomplished in the past year while concurrently fielding and sustaining new systems to over 249 sites totaling over 1497 Navy/Marine Corps systems.

JMPS provides a scalable mission planning system that can be tailored by the planners. It meets specific needs and is deployed on a wide variety of hardware. JMPS provides collaborative, inter-service mission planning and information exchange for multiple airborne assets, and/or geographically distributed planners, working at the unit, wing, and force levels.

VFA-213, Fighting Blacklions[35]

The Joint Mission Planning Support Office (Code 24234) assisted VFA-213, the Fighting Blacklions, to accomplish their aircraft transition training from the F-14D to the F-18 E/F Super Hornet by deploying a new version of JMPS computer software. Since the early 1990s, the F-14 has used the Tactical Automated Mission Planning System (TAMPS) to load mission essential data to the aircraft. TAMPS is a legacy mission planning computer system that has exceeded its operational window.

The F-18 uses JMPS to program essential navigation, weapon, radio, tactical data link, communication, and radar data. Code 24234 fielded a new advanced version of F-18 JMPS software for VFA-213 during the first week of October to support their F-18E/F Super Hornet aircraft. The F/A-18E/F Super Hornet is an upgrade to the battle tested F/A-18.

VF-213's Super Hornet employs the newly developed AN/APG-79 Active Electronically Scanned Array (AESA) radar. This radar is currently in operational testing and features active electronic beam steering, which repositions the radar beam nearly instantaneously. SSC San Diego's deployment of software, hardware, user manuals, and training supports the Blacklion's mission to further evaluate the AESA radar in conjunction with Air Test and Evaluation Squadron Nine (VX-9) prior to fleet introductions.

JOINT EFFECTS MODEL (JEM)[36]

SSC San Diego conducted the first operational assessment for the Joint Effects Model (JEM). JEM will aid warfighters, homeland security, and municipal first responders in planning emergency counter actions

by displaying chemical, biological, radiological, and nuclear (CBRN) incident threats and hazards in near real-time. SSC San Diego provided the technical expertise, facility, equipment, and training to support the execution of JEM Operational Assessment One.

Over 50 warfighters and key personnel from the Air Force Operational Test and Evaluation Center, Army Test and Evaluation, Marine Corps Tactical Systems Center, and Navy Operational Test and Evaluation participated in the test. The 2-week assessment executed and evaluated the JEM software in the GCCS-M and combined GCCS-M/Collaborative Product Commerce 2 environments. Following extensive development testing, the evaluation was a crucial milestone. Results will determine the ultimate direction and continuation of the JEM development effort.

JEM is a multi-incident, accredited, model solution for displaying, in near real-time, CBRN incident threats and hazards to aid the warfighters, homeland security, and municipal first responders in counter action planning. Once fielded, JEM will be the standardized Department of Defense CBRN hazard prediction model. It will be capable of modeling hazards in a variety of military and homeland defense scenarios including counter force, passive defense, accident and/or incidents, high altitude releases, urban nuclear, biological, and chemical model environments, building interiors, and human performance degradation.

FLEET ENGINEERING

TECHNICAL HIGHLIGHTS[37]

- Developed and installed the Portable Coalition Communications capability (with Code 230) to support ongoing war efforts in the Navy Forces Central Command area of responsibility.
- Worked across the Center, and closely with the operational and acquisition communities, to established Combined Enterprise Regional Information Exchange Systems-Maritime (CENTRIXS-M) as a program of record.
- The Sea Fighter C4I integration and test team supported accreditation, integration, testing, and light-off of systems needed to support Rim of the Pacific (RIMPAC) 06. (See "Seafighter" below for discussion.)
- Teamed with the AN/WSC-8 in-service engineering agent to improve the antenna overhaul capability for the AN/WSC-8 antenna assembly.
- Continued to lead the C4I transition effort for the United States Pacific Command, Pacific Warfighting Center military construction.
- Supported the information technology transition effort for National Oceanic and Atmospheric Administration Pacific Region Center facility construction.
- Developed, installed, and maintained the Combined Enterprise Regional Information Exchange System Cooperative Maritime Forces Pacific on the Global Counter-Terrorism Forces network.
- Developed initial plans for the U.S. portion of the Singapore Command and Control Center.
- Engineered a major upgrade of the Commander, U.S. Pacific Fleet Command Center.
- Composed the core communications team for Joint Task Force-Homeland Defense, providing C4I planning and support.
- Completed a highly successful C4ISR modernization package on USS *Kitty Hawk* (CV 63). (See "C4ISR Modernization Package for USS *Kitty Hawk* (CV 63)" below for discussion.)
- Continued research, development, and installation of Radio Frequency Identification (RFID) tags. (See RFID tags article below for discussion.)

SEA FIGHTER[38]

A cross-department team from SSC San Diego, SSC Charleston, and the Center's industry partners supported events leading up to the Sea Fighter C4I power-up/check-out (light-off) of equipment, and system deployment to the 2006 Rim of the Pacific (RIMPAC) exercise. The Sea Fighter is a Congressional Land-Sea interface special project that was called the "X-Craft" during development. Its C4I design, installation, and certification are unconventional using a hybrid of legacy systems and state-of-the-art technology. Support included:

- Provided the local area network assessment and helped evaluate the physical architecture as well as switch/router configuration.

- Prepared a detailed Systems Security Authorization Agreement.

- configured the Common Personal Computer Operating System Environment clients and mail servers to help bring the Secure Internet Protocol Router and Non-Secure Internet Protocol Router systems online.

- Led the Global Command and Control System-Maritime (GCCS-M) team, ensuring the ship had the critical infrastructure needed to provide the tactical picture and communications provided by the GCCS-M suite.

- Led the last-minute TIMEPLEX installation, testing, and system operational verification test.

- Led the satellite communications testing and end-to-end terrestrial link effort to ensure the ship-to-shore communications links were established and properly configured.

- Worked with the ship's force troubleshooting the Ku-band antenna system.

- Repaired all of the proprietary MT-RJ connectors and fiber-optic cabling that were critical to all other systems relying on the fiber backbone for communication to the network servers.

With limited funds, and a demanding time schedule, the team focused efforts to optimize all of the C4I systems and bring Sea Fighter online, enabling them to communicate as a standard Navy afloat platform.

C4ISR MODERNIZATION PACKAGE FOR USS *KITTY HAWK*[39]

SSC San Diego completed a highly successful command, control communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) modernization package on USS *Kitty Hawk* (CV 63). The installations were executed during *Kitty Hawk's* annual Selected Restricted Availability that started in early January 2006 and completed at the end of May 2006. The modernization package was highlighted by a complete replacement of the ship's legacy asynchronous transfer mode local area network (LAN) with a state-of-the-art Gigabit Ethernet LAN (GIG-E).

During the availability, multiple operationally critical C4ISR capability enhancements were installed, including:

- Theater Battle Management Core System software upgrades for improved air wing planning
- Computer Network Defense software
- An additional Combined Enterprise Regional Information Exchange System to allow simultaneous information sharing between multiple coalition partners
- Air Defense System Integrator Version 12 for improved tactical data link operations
- Automatic Identification System for improved maritime awareness
- GIG-E LAN

To accomplish the replacement, *Kitty Hawk's* crew and embarked staff were moved to various temporary office spaces ashore. *Kitty Hawk's* Ship Superintendent and the SSC San Diego team ensured that the crew and staff could sustain operations as if they were actually onboard *Kitty Hawk*.

The key to the success of the availability was the critical testing of the newly installed LAN and pending migration of more than 5000 users back aboard *Kitty Hawk* for normal classified and unclassified LAN operations. *Kitty Hawk's* Strike Group Commander challenged SSC San Diego to reduce the normal migration time-frame and coinciding LAN service outage from 120 hours to 12 hours at the start, and 12 hours at the end. The SSC San Diego team successfully met this challenge.

The enhancements brought about through use of GIG-E technologies will afford *Kitty Hawk* and operational customers the reliability and quality of service necessary to ensure that information dominance is effectively sustained and projected in support of Pacific Fleet operations.

RADIO FREQUENCY IDENTIFICATION (RFID) TAGS[40]

SSC San Diego is placing passive Radio Frequency Identification (RFID) tags on certain sponsor-owned material to reduce inventory time and the possibility of human error.

The power source for the passive RFID tag is supplied by the handheld reader: a special radio frequency transmitter. Unlike a barcode reader, the RFID reader does not require line-of-sight to read the tags, and can read through many materials including paper, cardboard, and a certain thickness of wood. A handheld

reader can inventory several hundred tags within seconds. Conducting an inventory of 85 circuit card assemblies (CCAs) in an EHF system terminal now takes approximately 2 hours to complete. With passive RFID tags installed on each CCA, the inventory can be completed in less than 5 minutes. The time required to inventory one EHF terminal is reduced to less than 1/24th of the previous time. Incorporating passive RFID technology will provide hands-free data capture and enable efficient recording of material transactions.

In addition to applying RFID technology for all assets, inventory planning, and shipping and receiving, SSC San Diego is pursuing the possibilities of using RFID to monitor specific parameters of satellite communications systems.

SSC San Diego is also researching applications for active RFID tags. Active RFID tags are battery-powered tags capable of continuously transmitting data. Capabilities of active RFID tags are analog and digital input/output; external sensors, including temperature and humidity; extended memory; tamper detection; and shock and vibration sensing.

INTELLIGENCE, SURVEILLANCE, AND RECONNAISSANCE

TECHNICAL HIGHLIGHTS[41]

- Developed the Bi-Static module to provide the Littoral Combat Ship Mission Package a large-area search capability from an unmanned surface vehicle.
- Successfully tested and demonstrated the integrated network of sensors for the Small Business Innovation Research Technology Oversight project.
- Provided software and hardware support to establish a Navy organic data provider service for the Maritime Domain Awareness Data Sharing Community of pilot. Also provided software development support for other data providers to interface with Net-Centric Enterprise Services Federated Search and Messaging services.
- Provided services in project management, system engineering, logistics, testing, installation, training, and maintenance to support the naval intelligence community and other U.S. agencies.
- Installed Automatic Identification System (AIS) Server on USS *Ronald Reagan* (CVN 76) and USS *Boise* (SSN 764). (See AIS article below for discussion.)
- Conducted successful test of Multi-Influence Tripwire System (MITS) nodes. (See MITS article below for discussion.)
- Conducted HULSFest 2006. (See "SHIP-HULL INSPECTION EFFORTS: HULSFEST" below for discussion.)

AUTOMATIC IDENTIFICATION SYSTEM (AIS) SERVER[42,43]

USS *Ronald Reagan* (CVN 76)

On 13 January 2006, the Chief of Naval Operations (CNO) tasked a team from SSC San Diego and Program Executive Office, Command, Control, Communications, Computers, Intelligence and Space (PEO C4I and Space) to enhance the USS *Ronald Reagan's* (CVN 76) situational awareness of commercial shipping prior to entering the U.S. Navy's Central Command area of operations. The team provided the Automatic Identification System (AIS) Server, a means to automatically integrate AIS contacts into Global Command and Control System-Maritime (GCCS-M).

At the Center's labs, a combined team from the Intelligence, Surveillance, and Reconnaissance Department, the Command and Control Department, and PEO C4I and Space developed an integrated package. The Joint and National Systems Branch created the AIS Server using the Extensible Common Operating Picture Server. It features a range of commercial off-the-shelf software that processes, stores, and correlates AIS contacts and tracks prior to providing them to GCCS-M. Initial response from *Ronald Reagan* indicates the AIS Server Solution is a critical situational awareness tool that is significantly improving the tactical commander's ability to assess his operational environment.

Personnel from Networks, Information Architecture, and Enterprise Services (PMW-160) provided the necessary upgrades to the Radiant Mercury High Assurance Guard to facilitate the communications flow between the AIS transceiver, the AIS Server, and the ship's command and control suite. Personnel from Signal Exploitation and Information Management designed the infrastructure for implementation into the ship and conducted all procurements to make this short fused requirement a success.

Two weeks after the CNO's tasking, the SSC San Diego/PEO team mocked up the capability in the Center's Land Based Test Facility for initial testing. For 1 week, the team operated in a test-and-fix environment until preliminary test results revealed that the end-to-end AIS Server Solution was stable enough to install.

On 4 February, the team met *Ronald Reagan* in Singapore to install and test the end-to-end AIS Server Solution. Several members of the team remained aboard during *Ronald Reagan's* transit of the Strait of Malacca to provide operator training and ensure that the AIS Server Solution remained operationally capable. *Ronald Reagan* began using this innovative, rapid deployment capability more than a year ahead of the original AIS schedule.

USS *Boise* (SSN 764)

During the week of 21 August, the AIS Server was installed aboard the *USS Boise* (SSN 764) at Norfolk, Virginia. The installation team also provided training and testing for the ship's crew. This was the first installation of the AIS Server on a submarine.

MULTI-INFLUENCE TRIPWIRE SYSTEM (MITS)[44]

Two Multi-Influence Tripwire System (MITS) nodes were successfully deployed in the waters off of Port Hueneme, California, in October. During the test period of approximately 1 week, both units collected acoustic and magnetic data, and generated acoustic contact reports. The base station received the contact reports, logged them, and sent them to the Graphical Data Fusion System (GDFS). GDFS successfully received the reports and displayed the data along with other Mobile Inshore Undersea Warfare (MIUW) sensor information. Information is only sent to shore when a contact has crossed a user-defined bearing of interest, allowing the sensor to meet its objective of operating as a trip-wire.

Further analysis of an acoustic signature can be performed by monitoring any one hydrophone or beam at a time via the radio frequency (RF) link. In addition to the acoustic capability, magnetic data can be streamed to the base station. Shore processing of the magnetic data can provide additional confirmation of the presence of a sub-surface ferrous metal object moving in the vicinity of the sensors.

The contact report data from MITS has been integrated into the MIUW GDFS display. GDFS is Navy-owned software, designed and maintained by Advanced Systems and Applied Sciences Division (Code 237) personnel. GDFS provides MIUW with a complete tactical picture of their operating area as well as sensor control for radar, imaging, and subsurface sensors.

The MITS acoustic sensor consists of a seven-element planar array in which each element is a miniaturized Directional Frequency and Ranging sensor. The magnetic sensor is a commercial off-the-shelf, full-field Overhauser magnetometer from Marine Magnetics. The subsurface nodes automatically form multiple beams spanning 360 degrees that continually track all contacts in range of the sensor. The nodes are connected to a surface float for RF connectivity to shore.

SHIP-HULL INSPECTION EFFORTS: HULSFEST[45]

SSC San Diego's Unmanned Maritime Vehicles Laboratory (UMV Lab) conducted HULSFest 2006, an event which will lead to reducing the risk to divers and increase the Navy's effectiveness in neutralizing the threat from mines and other explosive devices. The technical information gathered at the event will make an important contribution to the Navy's ship-hull inspection efforts.

Divers must search ship hulls for limpet-type mines or other threat devices. Keeping track of the divers' precise location underwater is a continuous challenge complicated by currents, mooring equipment, ship movement, and a host of other obstacles. While advances have been made in diver equipment, such as hand held sonar devices and advanced communications systems, searching for possible mines attached to the hull under these conditions has obvious drawbacks, particularly if a mine is located.

Through the Explosive Ordnance Disposal Technical Division (EODTECHDIV), the Navy is developing alternatives to using divers for searching ships' hulls. Increased emphasis on anti-terrorism/force

protection measures requires faster and more efficient ways to search military and civilian ship hulls for threat devices. The EODTECHDIV is developing technical requirements and procurement specifications for a Hull Unmanned Underwater Vehicle Localization System (HULS).

HULS is essentially an underwater robot optimized to rapidly and accurately survey a hull underwater. The complex and varied shape of ships' hulls requires sophisticated navigation and vehicle controls systems and sensors that can accurately differentiate between normal hull-mounted equipment and limpet mines. This is a difficult task demanding 100 percent accuracy.

Sponsored by EODTECHDIV, the UMV Lab invited 26 vendors from the U.S. and five foreign countries to visit SSC San Diego Bayside and demonstrate their current technology in hull search systems. The systems range from 'hull crawlers' that magnetically or hydraulically attach themselves to the hull, to autonomous vehicles that are programmed with a search mission and launched into the water independently of operator control. For the HULSFest event, mine-like shapes were placed on the hull of the Research Vessel Acoustic Explorer moored at Pier 160B, Bayside. Vendors were challenged to locate these mine shapes in realistic conditions, under constraints similar to the real-world conditions found at Navy piers.

The vendor's efforts were monitored by military and civilian observers, including technical evaluators from SSC San Diego. For the vehicle and system developers, this opportunity to work in realistic conditions increased their understanding of operational challenges and the Navy's mission requirements. Over 120 people from fleet activities, government labs, and industry participated in and observed the event, which was the first of this type ever held.

COMMUNICATIONS AND INFORMATION SYSTEMS

TECHNICAL HIGHLIGHTS[46]

- Spearheaded upgrade of the Navy's primary Internet Protocol networks onboard force-level ships.
- The Submarine Operating Authority completed installations for the Broadcast Control Authority at Commander Naval Submarine Force Norfolk, Virginia, and Commander Task Force 69, Naples, Italy.
- Along with Naval Air Systems Command, the Airborne Automated Digital Network System (aADNS) team designed, fabricated, and tested the aADNS capability on multiple airframes.
- Installed and tested the Hazardous Weather Detection and Display Capability aboard USS *Peleliu* (LHA 5). (See "Hazardous Weather Detection and Display Capability [HWDDC]" below for discussion.)
- Released the High Assurance Internet Protocol Encryptor Interoperability Specification V3.0 and associated Validation Test Tool.
- Completed development and the interim authority to operate for the Joint Tactical Radio System Information Repository.
- Supported communications interoperability following Hurricane Katrina and preparation for Hurricane Wilma (CY 2005). (See "Communication Assets Survey and Mapping (CASM)" below for discussion.)

HAZARDOUS WEATHER DETECTION AND DISPLAY CAPABILITY (HWDDC)[47]

On 15 February 2006, USS *Peleliu* (LHA 5) became the first U.S. Navy warship to deploy with a weather radar capability. SSC San Diego personnel were onboard to conduct an at-sea technology demonstration of the Hazardous Weather Detection and Display Capability (HWDDC). This technology demonstration culminated an accelerated development schedule for HWDDC Version 0.

The Meteorological and Oceanographic Systems Program Office (PMW-155) tasked SSC San Diego to study the technical alternatives that would lead to a weather radar capability at sea. The carrier's limited topside space for an additional radar antenna precluded a commercial-off-the-shelf solution. However, a study of existing tactical radars showed that the AN/SPS-48(E) 3-D volume search radar had many of the same characteristics as the National Weather Service's Next Generation Weather Radar, the WSR-88D.

ITT Gilfillan, the manufacturer of the AN/SPS-48(E), was tasked to conduct a feasibility study to investigate the potential of extracting digital data from the radar for weather processing. The results of this study were very positive, and ITT Gilfillan subsequently developed the Weather Data Interface Card, a prototype to passively tap into the radar data stream and extract digital data.

As ITT Gilfillan was developing the prototype card, SSC San Diego began developing software to display weather data. Vendors were sought to develop the hardware and software to process the radar data stream into a standard weather radar data format. In May 2005, Basic Commerce and Industries (BCI), Incorporated was awarded a contract to develop the Weather Extractor Computer.

On 3 January 2006, SSC San Diego began a month-long system test at Dam Neck, Virginia, utilizing the AN/SPS-48(E) radar. Gilfillan's production version of the Weather Data Interface Card was installed in the radar to output a synchronous data stream to the BCI-developed Weather Extractor Computer. The Weather Extractor Computer provided standard weather radar formatted files to the Weather Processor Computer for display. Operation of the HWDDC was verified without impact on the AN/SPS-48(E) operation.

On 25 January, full system testing was reported complete and successful. Concurrently during January, the SSC San Diego's Alteration Installation Team began installing the HWDDC onboard *Peleliu*. Operation of the system was tested 2–3 February.

The first real-world test of the HWDDC in heavy weather occurred 22 February. Using the weather radar display on the bridge and interpretation provided by onboard METOC personnel, the Commanding Officer of *Peleliu* maneuvered the ship to avoid the hazardous weather and was able to conduct a morning of flight operations that he would have otherwise lost. The average daily cost for an LHA Amphibious Assault Ship is about $260,000—saving a morning of flight operations represents a large return on investment.

Installation of the HWDDC is planned for all AN/SPS-48 platforms: CVN Multi-Purpose Aircraft Carrier (Nuclear), LHA Amphibious Assault Ship (General Purpose), LHD Amphibious (Multi-Purpose), and LPD Amphibious Transport Dock-17 class ships.

COMMUNICATION ASSETS SURVEY AND MAPPING (CASM)[48]

Note: Accomplishments described here occurred in CY 2005.

The Communication Assets Survey and Mapping (CASM) tool, developed under the leadership of SSC San Diego's Communication and Technology Branch, supported communications interoperability during two significant events during CY 2005, the aftermath of Hurricane Katrina and preparation for Hurricane Wilma.

The CASM tool enables information on regional communication systems and interoperability to be collected, standardized, maintained, and presented graphically on a Web-based map display. CASM's simple, graphical interface exposes interoperability gaps and displays solutions in a given region. CASM has two components to address the interoperability of available communication assets: a website for data collection and a user application for data visualization and analysis. A set of forms and a database can collect information on urban area communications and interoperability assets such as radio systems, interconnect gateways, and the agencies that use them.

In July 2005, the communication data survey for New Orleans began as part of a review of the region's emergency communications capability. In the aftermath of Katrina, the data collected were the only available records for antenna locations. Other records were not accessible because of power losses or physical destruction. As agencies throughout the country assembled to support New Orleans, a key activity was to replace antennas. With the online data gathered in CASM, New Orleans could augment its paper records to restore emergency communications.

As Hurricane Wilma approached the Florida coast in October 2005, the Florida Regional Domestic Security Task Force Region Seven (Miami) requested access to the radio communications infrastructure information that had been previously collected for the CASM tool. In working with Interoperable Communications Technical Assistance Program (ICTAP), Miami was also granted access to Regions Four (Tampa) and Five (Orlando) that had also participated in CASM data collection and served as mutual aid partners in Florida. All three regions shared the CASM information and Southern Florida was able to assess communications interoperability options before Hurricane Wilma struck.

As of July 2006, approximately 2500 jurisdictions corresponding to approximately 5000 agencies have entered data into CASM. The tool is beginning to gain favor with military agencies, and several Navy, Army, and Air Force organizations have entered their communications information into the CASM tool. SSC San Diego is contracted to provide system engineering, management, tool development, operation, and planning support for CASM software tool development.

APPENDIX A: CY 2006 ACHIEVEMENT AWARDS

NAVY AWARDS

Navy Superior Civilian Service Award[49]

Public Affairs Officer (PAO) Tom LaPuzza received the Navy Superior Civilian Service Award for outstanding career accomplishments. SSC San Diego Commanding Officer Capt. Frank Unetic and Dr. Delores Etter, Assistant Secretary of the Navy (Research, Development and Acquisition) presented the award. LaPuzza has served the Navy and the Center in the public affairs field for 36 years. He served as SSC San Diego PAO for the past 18 years. LaPuzza distinguished himself in representing SSC San Diego to the media, the community, the Navy, the Department of Defense, and other government entities.

SPAWAR Lightning Bolt Awards

Tactical Communication Solutions (TCS)[50]

The Tactical Communication Solutions (TCS) team (Code 24524) received the SPAWAR Lightning Bolt Award in recognition of the level of performance that led to TCS's successful CMMI Level 2 appraisal.

TCS was assessed as operating at a Capability Maturity Model Integration (CMMI) - Systems Engineering/Software Engineering Maturity Level 2. This determination was based on a Standard CMMI Appraisal Method for Process Improvement (SCAMPI) Class A appraisal. The achievement of a CMMI Level 2 rating validates that an organizational unit is using quality processes in conformance with seven process engineering and management areas to provide high-quality products and services to its customers.

Enhanced Position Location Reporting System (EPLRS)[51]

The Joint Tactical Systems Branch (Code 2337) received the SPAWAR Lightning Bolt Award in recognition of engineering, technical, and logistics support for the installation, checkout, and operational verification of EPLRS Data Radio (EPLRS-DR) Shipboard Radio System and for the EPLRS component of the AN/KSQ-1A(V) Amphibious Assault Direction System prior to and/or during their deployment to participate in operations in the Persian Gulf and Western Pacific. The team procured, performed operational checkout, and delivered EPLRS equipment required for installation aboard various other amphibious ships scheduled to support Operations Enduring Freedom and Iraqi Freedom. They completed the conversion of EPLRS Network Manager vehicles for use by the Army in combat operations in Iraq. The efforts of the EPLRS team contributed directly and significantly to the operational readiness of U.S. Navy, Marine Corps, and Army units deployed in support of Operations Iraqi Freedom and Enduring Freedom.

Center employees awarded included Larry Beel, Rich Bonavida, Bill Boyer, James Cummins, Rich Downie, Mark Econie, Hank Holloway, Carousel Jagualing, Christopher McNamara, Cary Meriwether, Larry Mohr, Kenneth Ng, Maria Posis, and Reg Rheaume.

Global Positioning System Sea Navigation Warfare Phase 1B[52]

The Sea Navigation Warfare team received the SPAWAR Lightning Bolt Award in recognition of support to PMW-170 to complete the Navy's first combined Development Test (DT)/Operational Assessment. The team successfully met the DT objective to demonstrate the merit of integrating an AS-4565/SRN anti-jam Global Positioning System (GPS) Antenna System Fiber Optic Antenna Link with the Navigation Sensor System Interface and AEGIS Combat Systems aboard a guided missile destroyer to counter GPS jamming.

Center employees awarded included Maggie Jones, Paul Steele, Paul Bachta, Tom Broadaway, Ann Hess, Charles Falchetti, Jeanne Abriel, Rick Hyatte, Romy Vu, Mark Reissig, Dave Dawson, Diana Arceo, and Dave Southworth.

Hurricane Katrina Relief – Dolphin Rescue and Caretaking[53]

The Biosciences Division (Code 235) received the SPAWAR Lightning Bolt Award in recognition of their assistance in the rescue and care of eight dolphins that were washed out into the Gulf of Mexico when Hurricane Katrina's storm surge destroyed their enclosures. The team included contractors from Science Applications International Corporation and the Earl Dodge Osborne Corporation that provided assistance during the recapturing of these animals. The team members then used their expertise to set up and operate temporary pools to comfortably house the animals during their recovery period. The team worked closely with the various regulatory agencies involved: the National Oceanic and Atmospheric Association, U.S. Department of Agriculture, and the Marine Life Oceanarium personnel.

Center employees awarded included Bob Olds, Eric Bauer, Braden Duryee, Scott Price, and Phil Roberts.

CNO Letter of Commendation

Composeable FORCEnet (CFn)[54]

SSC San Diego's Composeable FORCEnet (CFn) team was presented a Letter of Commendation from the Chief of Naval Operations for meritorious service from 1 January to 1 June 2005. The team's efforts accomplished Navy security strategy objectives in the Asia-Pacific region, set the Navy standard for design implementation and support of CFn, and enabled the national warfighting strategy.

The CFn employee and contractor team members named in the citation were Eric Abad, Jay Barlis, Wyatt Bertell, James Boerke, Laurie Byer, Donnie Camp, Robin Chu, Jeff Clarkson, Farley Delacruz, Edwardo Flores, Mark Gabriels, Jack Gerrard, Doug Hardy, Jeff Grossman, Jack Heckerman, Eleanor Holmes, Tony Holst, Aaron Hudson, Paul Iordanides, Aaron Judd, Keith Khron, Dan Lawrence, STSCS Dave Levin, Jimmy Linh, Rick Loanzon, Orlando Lugo, Zack Marble, Jay Martin, Bruce McCoy, Richard McGiff, Jay McInvale, Jim Metzger, Dave Moolenaar, Marco Muniz, Robert O'Leary, Joe Orndorff, Christopher Priebe, Bobby Ramirez, Mike Reilley, Brian Richardson, Matt Scallon, Mark Schwartz, Carl Suttle, Tony Truong, Leticia Walton, Sandy Wetzel-Smith, Wally Wulfeck, and Pete Wussow.

Management/Information Technology Award[55]

The Management/Information Technology Award 2005 was presented by the Assistant Chief of Naval Operations for Information Technology to the Task Force Navy Family (TFNF). The Center provided on-site and San Diego support to Hurricane Katrina recovery efforts using a decision-management process and Web-based collaboration tools to support TFNF for shared situational awareness. The knowledge management applications employed by the TFNF staff were used in ongoing efforts to track the status and the history of assistance to more than 25,600 Navy families. The enduring result of TFNF work will be the ability to rapidly resolve catastrophe-related family issues with collaborative tools and processes. The CNO also directed that TFNF develop a new Navy family response plan for future crises.

Center employees sharing the TFNF award included Shawn David, Ivor Inancsi, Stan Purington, Anh Quy, Nick Rodrigues, Matt Tran, Tam Tran, Ted Tran, and Donna Williamson.

Dr. Arthur E. Bisson Prize[56]

Dr. Jeff Morrison, Human Systems Integration (Code 246205), received the Dr. Arthur E. Bisson Prize for Naval Technology Achievement. The prize is granted by the Office of Naval Research to programs that have a significant, transitional impact on naval operations. Insights into the operational implications

of network-centric warfare led him to identify a number of operational requirements for decision-making that could be addressed through innovative decision support tools. Tools such as the Knowledge Web were used with great success by Rear Adm. Thomas Zelibor and his staff aboard the USS *Carl Vinson* (CVN 70) during Operation Enduring Freedom.

Navy Information Management/Information Technology Award[57]

The Department of the Navy Information Management/Information Technology Award 2005 was presented to the *USS Ronald Reagan* (CVN 76) Information Technology Networks Support Team. The effort ensured that the ship's local area network/wide area network system was operationally ready to meet mission requirements. The team's success significantly improved the capabilities of this critical information technology networking infrastructure aboard *Ronald Reagan*.

SSC San Diego personnel involved in this effort included members of SPAWAR Systems Center Pacific, the Fleet Engineering Department, and the Communications and Information Systems Department

Navy Modeling and Simulation (M&S) Award[58]

Navy M&S Award for Analysis

The Navy Modeling and Simulation (M&S) Award for Analysis was presented to Chris Alspaugh. who represented the SSC San Diego Network Centric Warfare Analysis Branch (Code 2822) at the Department of Defense M&S Conference. From January 2004 to March 2005, Alspaugh led development and deployment of a network-centric simulation tool to support naval operations and acquisition processes. The Network Warfare Analysis Simulation is a federation of the Naval Simulation System and the Network Warfare Simulation. This capability provides a direct mapping between technical measures of performance to operational effectiveness. It is used to support the Navy budget inputs as well as operational deployment of new network technologies.

Navy M&S Award for Acquisition

The Navy M&S Award for Acquisition was presented to Alspaugh and Dr. Cam Tran (Code 2822), representing the Regional Network Operations and Security Center (RNOSC) M&S Team. The RNOSC M&S Team was successful in modeling the Navy Shore Communications Infrastructure to support PMW 790's Tactical Switching Program through Milestone Decision B. The team's efforts helped ensure that an efficient communications network was developed with the $70 million funding from the Shore Infrastructure Modernization initiative.

EXTERNAL/INDUSTRY RECOGNITION

NDIA Fleet Support Award[59]

Jonathan Wells, Tactical Network Communications Branch (Code 2631), was presented the National Defense Industrial Association (NDIA), San Diego Chapter, Fleet Support Award (Civilian). This is presented to nationally recognize an individual's contributions to fleet support through managerial achievement. Wells is project manager for the Advanced Digital Network System (ADNS) in-service engineering activity (ISEA) and is responsible for sustaining the 12 ADNS variants on submarines and surface, shore, and airborne platforms. On 29 November 2005, PEO C4I & Space approved a full rate production decision for ADNS Increment II, with full funding authority and permission to place ADNS Increment II on 110 ships. Along with the ISEA team, Wells supported PMW 160-1 efforts by completing an integrated logistic assessment with zero discrepancies. The team ensured installation of fully functioning Increment II technical training equipment before the first shipboard system was

installed. The team performed a flawless demonstration and operational test event that significantly accelerated the implementation timeline and obtained an approved Naval Training Support Plan.

Hispanic Engineer National Achievement Award (HENAAC)[60]

Ayax Ramirez (Code 2853) was selected for the 2006 Hispanic Engineer National Achievement Award (HENAAC), Luminary Honoree, for his significant contributions to the Hispanic technical community. The HENAAC mission is to enlighten the nation about Hispanic achievements in engineering, science, technology, and math; motivate and educate students to pursue careers in those fields; and increase the role of the Hispanic community in maintaining the status of the U.S. as the world's technology leader. Ramirez is a recognized physicist and Center manager in the area of photonics. Ramirez has championed programs at SSC San Diego that introduce young people to careers in science and engineering, including mentoring students under the Mathematics, Engineering, and Science Achievement Shadow Day program and the Science and Engineering Apprentice Program.

CENTER CIVILIAN AWARDS

Lauritsen-Bennett Awards[61]

The Award for Excellence in Staff/Support was presented to Public Affairs Officer Tom LaPuzza (Code 2003). The Award for Excellence in Engineering went to Joe Rice, Advanced Acoustic Research (Code 2716), and the Lauritsen-Bennett Award for Excellence in Engineering was presented to Dr. Peder Hansen, Electromagnetics and Advanced Technology Technical Staff (Code 28505).

Tom LaPuzza

Tom LaPuzza worked at the Center for most of his career and served as the PAO for the past 18 years. LaPuzza's comprehensive understanding of Center history and programs has provided visiting dignitaries with an appreciation of the important role the Center has played in national defense. Whether acting as the release authority for unclassified technical information, serving as the command spokesperson for the news media and general public, or serving as the spokesperson for the Navy Marine Mammal Program, he has been a champion for the remarkable work produced by the Center's scientists, engineers, and support personnel.

Joe Rice

Joe Rice is a widely acknowledged expert in underwater digital acoustic communications. He began his career at the Center in 1981, and is currently the SSC San Diego Engineering Acoustics Chair at the Naval Postgraduate School, Monterey. His work in shallow water acoustic propagation and passive sonar has been important in the Navy's shift to littoral warfare capabilities.

Envisioning a networked underwater battlespace he originated the Seaweb Initiative, which is acclaimed throughout the operational Navy. Seaweb is a submarine communications concept that is an enabling technology for undersea distributed sensors, vehicles, and instruments. Rice has served as chief scientist or test director for over 30 sea trials and experiments. He is an author on more than 100 technical papers and an enthusiastic advocate, coordinator, facilitator, mentor, and consultant for the research and development community.

Dr. Peder Hansen

Over a career spanning almost 36 years at the Center, Dr. Peder Hansen has become an international expert on antenna design. He helped develop specialized high-frequency communications systems and is a leader and innovator in the preservation and expansion of the strategic fixed very low frequency/low

frequency (VLF/LF) communications system. His work has enabled the Navy to maintain the stealth communications necessary for submarine operations.

Dr. Hansen found cost-effective solutions to key difficulties essential to three high-voltage engineering efforts. He influenced the design and introduction of a basic insulator, helped stand-up a new specialized high-voltage test facility, and wrote a comprehensive reference manual for VLF/LF high-voltage engineering. He has been awarded patents, written Navy reports, and authored papers in journals such as *Radio Science* and *Institute of Electrical and Electronics Engineers Transactions on Antennas and Propagation*.

Executive Director's Awards

Don Milstead[62]

Don Milstead was presented the SSC San Diego Executive Director's Award in recognition of his technical and programmatic leadership in developing the Global Information Grid-Evaluation Facilities (GIG-EF). Milstead aligned the Navy's FORCEnet initiative and the Department of Defense GIG-EF effort to greatly enable network-centric operations. Milstead, who recently retired, was division manager for the Radio Frequency Communications Systems Division (Code 284).

Celia Metz[63]

Celia Metz was presented the Executive Director's Award for her 20 years of engineering and leadership excellence at SSC San Diego. Ms. Metz currently serves as the Fleet Engineering Department (Code 260) Deputy for Operations, overseeing day-to-day operations of the department. She initiated Code 260's academic program, coordinated the 2005 Base Realignment and Closure defense, and acted as a Navy Security Personnel System Executive Change Agent. She is also a member of the TEAM SPAWAR Competency Aligned Organization Integrated Product Team and serves as a Center facilitator for strategic planning.

Meritorious Service Awards

In recognition of civilian service or contributions of high value or benefit to the Navy.

Jeanne Abriel, for demonstrating system concepts and applications to enhance warfighter capabilities as test director for the Advanced Amphibious Direction System; **Terry Albert,** for pioneering new technologies and leading teams across organizational boundaries for rapid growth in existing projects and new business initiatives; **Ed Alburo,** for leading the Tactical Communication Solutions business area as the first Center program to embrace Capability Maturity Model Integration, and one of the first projects to achieve a CMMI Level 2 assessment; **Chris Alspaugh,** for spearheading the use of Network Centric Warfare Modeling and Simulation for operational assessment and acquisition planning; **Rich Arrieta,** for leading the Unmanned Maritime Vehicle laboratory in managing nine unique projects, including the unmanned undersea vehicle project used in Operation Iraqi Freedom;

Barbara Barber, for serving as a peer leader and advocate for the administrators within her department, and the focal point for all financial and administrative data calls;

Daryl Ching, for heading shore efforts to extend the Combined Enterprise Regional Information Exchange System networks to U.S. and coalition naval forces throughout the world; **Jeff Clarkson,** for briefing and demonstrating the Center's vision of Composeable FORCEnet to over 100 high-ranking officials; **Lynn Collins,** for demonstrating outstanding leadership as branch head of the Applied Technologies Test and Evaluation Branch and as a project manager;

Melissa Dolan, for her work with the marine mammal veterinary team to procure unique medical supplies, including procurement for a system to house bottlenose dolphins in Bahrain; **Dr. Brooke Dubbelday,** for managing the Border Transportation Security Network project and coordinating a large, cross-departmental team to make it a success;

Frank Greco, for his key technical role in consolidating the Image Product Library on a single server; **George Green,** for serving as the principal investigator for the Collaborative Distributed Fusion project that explores the use of modular fusion components in a services-oriented environment; **Brian Groarke,** for serving as director of the Systems Engineering Process Office, including directing the team responsible for improving project management, systems, and software engineering process capability and maturity;

Karen Haines, for serving as department representative on the Center's X-Code Implementation Planning Team; **Doug Hamaguchi**, for leading government and contract employees to provide a wide range of computer services for Team SPAWAR; **Mike Hendricks,** for providing continuous Secure Voice program support to the Navy, Air force, and Homeland Security communities worldwide;

Chris Johnson, for spearheading the Defense Information Systems Agency's Net-Enabled Command Capability;

George Kosmos, for his leadership of cutting-edge efforts to align the division's positioning, navigation, and timing capabilities with the Navy's FORCEnet initiative;

Tim Lam, for managing a strong and responsive engineering and logistics team that expanded from 11 to 22 employees within 1 year; **Karen Lawrence,** for leading six interrelated, high-visibility projects for the Homeland Security Advanced Research Projects Agency;

George McCarty, for serving as the Naval Science Advisor for Commander Submarine Force, U.S. Pacific Fleet, as head of the Submarine Communications, Information and Command, Control, Communications, Computers, and Intelligence (C4I) Systems Division, and as program manager for the Nuclear Command, Control, and Communications Program;

Raymond Navarro, for taking over the credit card program for Pacific C4I, Surveillance, and Reconnaissance and achieving distinction in the last external audit;

Malcolm Onuma, for coordinating and managing C4ISR installations onboard Navy ships and submarines;

Alan Rathsam, for serving as lead mechanical engineer for the Deployable Autonomous Distributed System through multiple phases of the project;

Barbara Scarton, for her long-term support of SSC San Diego Executive Directors;

Miles Terayama, for helping to establish Team SPAWAR as the incomparable provider of physical security systems in the U.S. Pacific Command area of responsibility; **Glenn Tolentino,** for serving as the senior systems engineer and project manager for the White House Situation Room Renovation Project;

Robert Vik, for contributing to many inter-department and inter-agency teams, and providing rapid and effective solutions to technical problems critical to the Global War on Terrorism;

Brian Whyte, for his support of Operation Cyber Condition Zebra, including successfully restoring logical networks after outages affecting thousands of customers across the entire Pacific region; **Dr. Earl Williams,** for his critical role in the success of the Border and Transportation Security Network project and for serving as the Command and Control Department representative to the Center's Homeland Security/Homeland Defense Anti-Terrorism/Force Protection Working Group; **Jimmie Williams,** for serving as the principal engineer for design and development of the SPAWAR/PEO Integrated Data

Environment and Repository and the Cost Estimating Tracking System; **Dave Willis,** for leading the Facility Management and Operations Division and providing overall management and strategic direction for the Center's infrastructure and resources.

Exemplary Achievement Awards

For sustained performance or specific achievements that merit Center recognition.

Greg Adams, for leadership of the Joint Tactical Radio System Test and Evaluation program; **Elaine Allen,** for leadership of the Framework for Anti-Terrorism Force Protection Information Management Project; **Jerry Almazan,** for execution and implementation of efforts to support the Navy's tactical cryptologic systems; **Sergio Alonso,** for maintaining the Center's heating, ventilation, and air conditioning equipment to prevent failures and outages; **Frank Anderson,** for planning and executing link systems assets during the Stellar Valkyrie Campaign; **Robert Ashley,** for assisting a complex, Defense Advanced Research Projects Agency contract with a critical award date; **Dan Austin,** for consolidating Defense Message System and Tactical Messaging Gateway systems;

Eric Bauer, for leadership in developing a system for housing bottlenose dolphins to meet Commander Fifth Fleet tasking in Bahrain; **Sean Biehl,** for serving as the test director for the Advanced Deployable System portion of the Pacific Fleet Task Force Anti-Submarine Warfare Exercise in 2004; **Henry Bluing,** for supporting the Department of Homeland Security Interoperable Communication Technical Assistance Program; **Steve Bolger,** for assisting in the successful conversion to a new contract writing tool mandated by the Department of Defense; **Marty Brown,** for providing management and technical oversight for a number of key acquisitions; **Andy Burcham,** for design and development of electro-optic surveillance systems being installed and used at locations worldwide;

Bob Carmichael, for acting as project manager at the Sea Test Facility on San Clemente Island; **Richard Cassity,** for directing the development and fielding of three new versions of software for the Marine Air Traffic Control and Landing System Software Support Activity; **Simon Chammas,** for managing and executing multi-million dollar programs for ultra high-frequency satellite communications legacy systems; **Clifton Chee,** for serving as regional shore installation manager for the mid-Pacific region and the point of contact for all C4ISR installations; **Lester Chong,** for developing and implementing a virtual private network protected Combined Naval Forces CENTCOM Community of Interest on the CENTRIXS network that enables tactical communication between U.S. and Coalition forces fighting the Global War on Terrorism; **Dr. Will Cronyn,** for acting as chief engineer for the Center's Wideband Gapfiller Satellite payload engineering model test team; **Dr. Dan Cunningham,** for technical leadership that enabled success of the Anti-terrorism Technologies Small Business Innovative Research Demonstration;

Daniel Davidson, for establishing the Networks and Information Systems Division Deputy for Operations position; **Maria De Guzman,** for assuming the Radio Frequency Communications Systems Division's Credit Card and Simplified Acquisition purchasing requirements; **Robert Dean,** for serving as the technical leader for the Navy Marine Corps Intranet architecture and enterprise team to certify and accredit new solutions; **Mike Dettman,** for leading development and implementation of a two-way interface between the All Source Analysis System-Lite and the Global Command and Control System-I programs; **Richard Downie,** for implementing a major upgrade for the Amphibious Assault Direction System; **Carl Dugan,** for acting as in-line network encryption subject-matter expert in support of the Navy, Marine Corps, and Coast Guard; **Braden Duryee,** for deploying with Naval Special Clearance Team One to the Northern Arabian Gulf to support Operation Iraqi Freedom and leading a team to Gulfport, Mississippi, to rescue eight dolphins washed from their enclosure during Hurricane Katrina;

Pat Dworshak, for accounting skills that made the Center one of the Navy Working Capital Fund organizations with a reconciled cash account;

James Eitelberg, for serving as senior systems engineer and lead software developer for the Homeland Security Border and Transportation Security Network as well as to Composable FORCEnet;

Mary Follett, for improving the Center's Tri-Annual Review process, clearing old items on accounts and improving SAP's cash-matching criteria; **Bette Fondas** for addressing a Naval Network Warfare Command request to restructure Naval Messaging worldwide;

Raquel Gensler, for serving as resource manager for the Information Assurance and Engineering Division to provide high-quality support to its customers; **David Gillette,** for serving as systems engineer for the Multistatic Off-Board Source Project, and deputy cost account manager for the unmanned surface vehicle-based Bistatic Mission Module; **Mary Gmitruk,** for developing and aligning the Center's Chief Technology Office with the Naval Network Warfare FORCEnet Enterprise; **Brian Granger,** for supporting projects and developing new business in the areas of unmanned maritime vehicles and remote ocean sensors; **Diana Griffin,** for representing the Pacific C4ISR Department on numerous management boards and providing help to the new management team in Hawaii, Guam, and Japan;

Steve Haight, for leadership as the Intelligence, Surveillance, Reconnaissance, and Information Operations (PMW-180) deputy assistant program manager for the Ship's Signal Exploitation Equipment Increment E system; **Rick Hemphill,** for leading the Multi-Agency Exchange Software Development Team on an important classified project; **Diana Holifield,** for developing state-of-the-art systems that are interoperable with the joint services; **Ken Howard,** for integrating Team SPAWAR business processes into true information technology systems; **Cindy Hui,** for pioneering work on the Information Assurance Vulnerability Assessment Management Application for tracking security compliance reporting; **Rick Hyatte,** for maintaining the Navigation Sensor System Interface laboratories;

David Jenkins, for core strategy development and exemplary support of the Command and Control Department; **Brian Jones,** for leading system engineering efforts for the U.S. Standing Joint Force Headquarters to support humanitarian efforts after Hurricane Katrina and the Pakistan earthquake; **Maggie Jones,** for overseeing the technical execution of all Global Positioning System and Navigation Division programs; **William Jones,** for supporting the Base Level Information Infrastructure Project Pier program;

Robert Keller, for helping establish the Center's role as the primary provider of C4I solutions to the Navy's Anti-Terrorism/Force Protection Ashore mission area; **Kim Kent,** for acting as the single point-of-contact, as SPAWAR Ship Superintendent, for all SSC San Diego installations aboard aircraft carriers in the San Diego area; **Dennis Klinger** for serving as the focal point for all Center products and services for the Coast Guard Deepwater Program; **Jack Knight,** for acting as business support group supervisor in the newly formed Installation Division;

Rick Lashley, for going beyond assigned duties to establish a Memorandum of Agreement between the Center and National Security Agency; **Steve Lawyer,** for coordinating the fielding of the Defense Messaging Service to all Marine Forces Pacific subordinate commands; **Wes Lee,** for serving as test lead for the Theatre Battle Management Core System and the Global Command and Control System-Maritime; **Clyde Lopez,** for providing insight, advice, and support to all projects in the Signal Exploitation and Information Management Division; **Joyce Loyd,** for coordinating the New Professional Program, recruiting over 850 science and engineering college graduates to the Center;

Dennis Magsombol, for providing technical expertise and hands-on work in network engineering; **David Malanaphy,** for expertise in the operator and maintenance components of tactical data links; **Sandi Manchor,** for preparing tactical interoperable communications plans and facilitating communications

exercises for a Department of Homeland Security program; **Wendy Massey,** for engineering contributions in the area of composite materials used in high-voltage applications; **Mary Moore,** for leading an administrative team of four branch assistants working with more than 130 personnel; **Susan Morales,** for leading the design, development, and deployment of the OE-578/USQ information operations antenna group; **Wayne Morinaga,** for developing the U.S. Pacific Command Theater's architectures for the unclassified and secret wide-area networks; and system architectures for C4 transformation projects; **John Murphy,** for leading development of new high-powered broadcast radio transmission systems and a new technology of digital shortwave radio; **Edward Murrill,** for establishing roles and responsibilities for SSC San Diego, including technical direction agent, government oversight, and monitoring;

Kraig Nasu, for implementing C4ISR system upgrades to support the bilateral exercise Keen Edge 2006 and leading the C4ISR modernization effort of the bilateral Joint Interface Control Cell at Fuchu Air Base; **Dr. Joseph Neff,** for leading a high-visibility project to develop new miniaturized electric and magnetic field sensors for persistent surveillance applications; **Tim Newton,** for leading the effort to receive and transmit Joint Blue Force situational data via the Joint Blue Force Situational Awareness project; **Quang Nguyen,** for efforts that gained approval for the Automated Digital Network System Increment 2a to proceed to developmental and operational testing; **Annette Nielsen,** for serving as security operations manager for the Signals Intelligence and Information Operations Program Office and as laboratory manager of the Sensitive Compartmented Information Facility;

Michael O'Gara, for leading the successful migration of the Joint Virtual Lab event from a static/multi-service demonstration of C4I interoperability to a dynamic display of warfighter capability in the field; **Gail Okumura,** for serving as an expert for Joint Worldwide Intelligence Communication System wide-area networks;

Chad Palermo, for leading efforts to develop and apply a more specific matching criteria for selecting outstanding accrual records for liquidation; **Sue Patterson,** for heading the Intelligence and Information Operations Systems Group; **Rafe Pei,** for leadership while serving as the program manager for the Ship's Signal Exploitation Equipment Increment E system; **Tony Pereira,** for serving on the division's Program Manager's Advisory Council for 2 years; **Chuck Peters,** for managing the Joint Semi-Automated Forces Project to rapidly model new systems and concepts of operation for United States Joint Forces Command J9 and forward deployed forces;

Linda Ranck, for providing peer review for a Department Simplified Acquisition Guide and developing Project Builder and Sales Orders training; **Christopher W. Raney,** for managing the fiscal and personnel resources as the Joint Training Mission expanded from 15 to over 45 annual training events; **Mark Rawlins,** for coordinating an experiment in the Pacific that successfully tested several new communications technologies for the submarine community; **Crystal Reed,** for acting as a major force in changing and improving Center policy and procedures for all integrated logistic support-related issues; **Jim Reed,** for improving contracting processes and strategy in the Submarine Communications, Information and C4I Systems Division; **Jason Ricks,** for leading the Consolidated Electronic Key Management System Tier 3 Test Infrastructure team; **Joseph Riley,** for supporting surveillance signal-processing development and implementation;

Frank Sanchez, for fielding the framework for the Anti-Terrorism/Force Protection Information Management System in three geographically distant regions; **Fredric Scali,** for outstanding performance as a member of the team that secured and restored the C4I infrastructure at Joint Interagency Task Force South in response to Hurricane Wilma; **Paul Shigley,** for serving as expert to cascade the Balanced Score Card down the organization; **Alvin Shimogaki,** for leading the teams that transitioned the Naval Computer and Telecommunications Area Master Station Pacific Technical Control Facility to the Nimitz-

MacArthur Pacific Command Center; **Drew Smith,** for leadership to deliver the first four Virginia-class submarine Command and Control System Modules; **Marsha Smith,** for serving as budgetary subject-matter expert on the Center's Zero-Based Budget General and Administrative Review Team; **Ray Stives,** for serving as Common Link Integration Processing lead to address critical program requirements; **Wilma Swayne,** for support to the Pacific C4ISR Department's Regional Shore Installation Manager;

John W. Thomas, for planning over 30 SSC San Diego alterations that were successfully installed on USS *Tarawa* (LHA 1) and USS *Peleliu* (LHA 5);

Sandra Van Densen, for instrumental contributions to milestone assessment of CMMI-Systems Engineering/Software Engineering Maturity Level 2 for the Tactical Communication Solutions project; **Mabel Vares,** for developing the Administrative Checklist for Contract Packages, a key tool for processing procurement requisitions; **Dennis Vernon,** for performance as a ship's superintendent, planning over 50 alterations to ensure coordinated and successful installation; **Anna Vo,** for contributing to acquisition of the next-generation, leading-edge Global Positioning System digital anti-jam antenna technology; **Rich Volkert,** for serving as chief system engineer for the Littoral Combat Ship Antisubmarine Warfare Mission Package Program;

Lee Wagner, for extracting weather radar quality information from the tactical scans of the SPS-48(E) Long-Range 3-D Volume Surveillance radar; **Arthur Watson,** for leading a combined U.S. government, contractor, and Taiwan Ministry of National Defense team through a successful Interoperability Development Test in Taiwan; **Joseph Weber,** for leading the Cabrillo Project Management Business Process Team that adapted the capabilities of the SAP product to serve the needs of Center project managers; **David Wegener,** for leading a major initiative providing critical classified information exchange in the Global War on Terrorism; **Jonathan Wells,** for leading an In-Service Engineering Agent team to significantly reduce the time required to bring a new Automated Digital Network System Increment from engineering design to a successful full rate production decision; **Sean Whaley,** for providing mechanical engineering, in-service engineering, and production management support to the Meteorological Mobile Facility (Replacement) program; **Alison Whelehan,** for oversight and assistance with funds management and purchasing for the technical professionals across the division; **Leslie White,** for managing the Ship's Motion Simulator and the Navigation Sensor System Interface laboratories; **Bill Wild,** for leading the REEFEX project to specify if, and how, the Navy can dispose of ex-warships in an environmentally acceptable manner;

Mark Yates, for serving as a key contributor to the successful deployments of Marine Mammal Systems to Iraq, Bahrain, and Naval Submarine Base Kings Bay, Georgia;

Ana Zaragoza, for acting as in-service engineering agent financial manager supporting all afloat networks' financial activities.

Center Team Achievement Awards[64]

The Border and Transportation Security Network team and the Digital Modular Radio test team were awarded the SSC San Diego Team Achievement Award. This award honors Center-wide efforts that demonstrate exceptional teamwork and accomplishments in a project, program, or initiative that is significant to the mission of SSC San Diego, the warfighter, and the nation.

Secretarial Awards[65]

The 2006 SSC San Diego Secretarial Awards were presented to four employees, in three categories: (1) Significant Group Achievement, Mary E. Moore and Tammie Speaker; (2) Specific Achievement Award, Russ Perna; and (3) Sustained Exceptional Performance, Tonya Marshall.

Science and Technology Excellence Awards[66]

The 2006 Science and Technology Excellence Awards were presented to Center scientists and engineers for sustained technical excellence and achievement. Receiving the award were Dr. Pam Boss, Navigation and Applied Sciences (Code 230); Dr. Donald Bamber, Command and Control (Code 240); John Mitchell, Fleet Engineering (Code 260); Dr. Joseph Fitchek, Intelligence, Surveillance, and Reconnaissance (Code 270); and Dr. John Meloling, Communications and Information Systems (Code 280).

Publication Awards[67]

Category 1 – SSC San Diego Technical Reports

Formal, Center-approved publications presenting results of an effort taken by the Center toward an objective defined by a sponsor.

Publication of the Year: Brian Ayers, Victoria Kirtay; "Use of Data on Contaminant/Sediment Interactions to Streamline Sediment Assessment and Management," TR 1918

Distinguished: Dr. James Finneran, "Effects of Intense Pure Tones on the Behavior of Trained Odontocetes," TR 1913

Category 2 – SSC San Diego Technical Documents (Technical)

Technical materials that do not fall under a technical report series.

Distinguished: Dr. Richard Adams, Dr. Peder Hansen, "Evaluation of "Q" in an Electrically Small Antenna in Prolate Spheroidal Coordinates," TD 3188

Honorable Mention: Dr. Earl Williams, "Tactical Tomahawk Weapon Control System v6 Land Attack Combat System Prototype Human–Computer Interface: Test Report for FY03 Fleet Operability Test," TD 3184

Category 3 – SSC San Diego Technical Documents (Administrative and Corporate)

Documents covering administrative aspects of the Center's technical work.

Honorable Mention: Kenneth Chung, Vivian DiCristofaro, James-Cooley Fitzgerald, Stephen Fox, Allan Gaidis, Robert Grant, Frank Greco, Dennis Lloyd, Kevin O'Malley, Barbara Wiley, "2003 Accomplishment Report: SSC San Diego C4I Programs Office Philadelphia," TD 3190

Category 4 – Special Documents

Posters, brochures, fact sheets, and all other high-level marketing materials.

Distinguished: Charles Katz, David Chadwick, Bradley Davidson, Ronald Gauthier, "Sinclair Inlet Water Quality Assessment"

Honorable Mention: Dr. Scott Rodgers, "3-D Photonic Crystals: Nano-Photonics for the Reduction in Size, Power, and Cost of Electronics," SD 554

Category 5 – Articles in the Open Literature

Articles appearing in academic or professional journals or scholarly books intended to be an original contribution to science or technology.

Publication of the Year: Amalia Barrios, "Estimation of Surface-Based Duct Parameters from Surface Clutter Using a Ray Trace Approach" *Radio Sci.*, vol. 39, no. 6, 17 December 2004.

Distinguished: John McDonnell (SSC San Diego) and Sushil J. Louis (University of Nevada), "Learning with Case-Injected Genetic Algorithms," *IEEE Transactions on Evolutionary Computation*, vol. 8, no. 4, August 2004.

Honorable Mention: Dr. James Rohr (SSC San Diego), M. Dale Stokes, Grant B. Deane, and Michael I. Latz (Scripps Institution of Oceanography), "Bioluminescence Imaging of Wave-Induced Turbulence," *Journal of Geophysical Research*, vol. 109, C01004, 2004.

Category 6 – Articles in Conference Proceedings

Publication of the Year: Dr. Visarath In, Yong Kho, Dr. Adi Bulsara, Dr. Joseph Neff, Dr. Brian Meadows, "Self-Induced Oscillations in Coupled Fluxgate Magnetometer: A Novel Approach to Operating the Magnetic Sensors," published in *International Symposium on Circuits and Systems*, 2004. ISCAS '04. 23-26 May 2004, pp. IV- 736-9, vol. 4.

Distinguished: Dr. Paul De La Houssaye, Dr. Stephen Russell, and Dr. Randy Shimabukuro, "Nanophotonic Applications for Silicon-On-Insulator," *Proceedings– SPIE, The International Society for Optical Engineering*, vol. 5359, 2004.

Honorable Mention: Dr. Joseph DiVita and Robert Morris, "A Systems Approach to Intelligent Task Prioritization in Complex Dynamical Systems," (source info not available).

APPENDIX B: CY 2006 PATENT AWARDS

Inventor(s)	Title	Patent No.	Date
Russell, Stephen D. Shimabukuro, Randy L.	Programmable gray-scale liquid crystal display	6,985,127	10 Jan 2006
Chadwick, David B. Groves, Gregory Jon Patterson, Andrew E.	Tidal seepage meter	6,993,437	31 Jan 2006
Adams, Richard C.	Wearable directional antenna	6,995,723	7 Feb 2006
Brock, David W. Joshi, Narayan R. Russell, Stephen D. Lasher, Markham E. Kasa, Shannon D.	Electromagnetic sensor system and method	6,998,835	14 Feb 2006
Adams, Richard C. O'Neil, Robert J. Lebaric, Jovan E. Emo, Todd R.	Integrated man-portable wearable antenna system	7,002,526	21 Feb 2006
Rubin, Stuart H.	Distributed biohazard surveillance system and apparatus for adaptive collection and particulate sampling	7,006,923	28 Feb 2006
Homer, Robert S. Calder, Bruce	Tapered slot antenna	7,009,572	7 March 2006
Boss, Pamela	Chemical detection sensor system	7,022,288	4 April 2006
Adams, Richard C. Hunt, Barry R.	Method and apparatus for simultaneous transmission of same frequencies	7,027,009	11 April 2006
Olsen, Randall B.	Planar multiple-tapped optical delay line	7,043,108	9 May 2006
Ptasinski, Joanna N. Shimabukuro, Randy L. Russell, Stephen D.	Method and apparatus for micro-Golay cell infrared detectors	7,045,784	16 May 2006
Rubin, Stuart H.	System and method for knowledge amplification employing structured expert randomization	7,047,226	16 May 2006

Inventor(s)	Title	Patent No.	Date
Maltby, John D.	Floating platform shock simulation system and apparatus	7,051,588	30 May 2006
Nelson, Robert S	Locator device for submerged structures	7,054,230	30 May 2006
Russell, Stephen D. Shimabukuro, Randy L.	Reconfigurable liquid crystal display	7,057,594	6 June 2006
Schwartz, David F. Helton, J. William Allen, Jeffery C.	Predictor for optimal selective power transfer	7,058,555	6 June 2006
Rubin, Stuart H. Chen, Shu-Ching	Distributed biohazard surveillance system and apparatus for adaptive aerosol collection and synchronized particulate sampling	7,082,369	25 July 2006
McCormick, Donald M. Crawley, Ken A. Glace, Dean A.	Compact antenna assembly	7,084,835	1 Aug 2006
Siekas, Jeremy John Pence, Deborah Valerie Liburdy, James Anthony	Syringe device for simultaneous infusion and withdrawal	7,094,222	22 Aug 2006
Meadows, Brian K. Heath, Ted H. Neff, Joseph D. Brown, Edgar A. Fogliatti, David W. In, Visarath Hasler, Paul DeWeerth, Steve P. Ditto, William L. York, Robert A.	Nonlinear beam forming and beam shaping aperture system	7,109,918	19 Sep 2006
Boss, Pamela A. Lieberman, Stephen H. Martini, Leonard J. Anderson, Gregory W.	Thermo-electrically cooled surface enhanced Raman spectroscopy sensor system	7,116,416	3 Oct 2006
Boss, Pamela A. Anderson, Gregory W. Lieberman, Stephen H.	Handheld thermo-electrically cooled surface-enhanced Raman spectroscopy (TEC-SERS) fiber optic probe	7,139,072	21 Nov 2006
Homer, Robert S. Mangra, Robbi Simonds, Hale B.	Concave tapered slot antenna	7,148,855	12 Dec 2006
Lu, Ryan P. Ramirez, Ayax D. Offord, Bruce W. Russell, Stephen D.	Method of tuning threshold voltages of interdiffusible structures	7,153,749	26 Dec 2006

APPENDIX C: CY 2006 DISTINGUISHED VISITORS

January

9   Mr. Bill Bann
     Principal Director, Defense Continuity & Crisis Management
     Office of the Secretary of Defense

10   Dr. Linton Wells
     Principal Deputy Assistant Secretary of Defense
     Command, Control, Communications & Intelligence (C3I)

11   VADM James D. McArthur, Jr., USN
     Commander, Naval Network Warfare Command

11   CAPT Thomas "Hank" Bond, USN
     Knowledge Management
     Naval Network Warfare Command

13   ADM Michael Mullen, USN
     Chief of Naval Operations

     CAPT Scott Hebner, USN
     Executive Assistant

17   Mr. Charles Moldenhauer
     Senior Military Systems Analyst
     L3 Communications/SYColeman

18   Ms. Rosemary Wenchel
     Director, Navy TENCAP (N7IR2)
     Office of Chief of Naval Operations

19   CAPT Paul Grosklags, USN
     Program Manager, Air Anti-Submarine Warfare
     Assault and Special Mission Programs (PMA 299)
     Naval Air Systems Command

19   RDML KEVIN McCoy, USN
     Deputy Commander, Ship Design, Integration & Engineering (SEA 05)
     Naval Sea Systems Command

24   BRIGADIER Simon Shadbolt, MBE, Royal Marines
     Director Equipment Capability, Command, Information Infrastructure (DEC CCII)

26   RADM Anders Grenstad, RSN
     Chief of the Navy, Royal Swedish Navy

     CAPT Bo Wallander, RSN
     Swedish Naval & Assistant Defence Attache, Swedish Embassy

February

2   RADM Donald Bullard, USN
     Commander, Navy Expeditionary Combat Command

7	ADM James Hogg, USN, (RET) Director, Strategic Studies Group (SSG)
14	Mr. Martin Faga President and Chief Executive Officer, MITRE Corporation
15	ADM James Busey, IV, USN, (RET) Vice Chairman, MITRE Board of Trustees
16	Ms. Nancy Suski Director, Emergency Preparedness and Response Science & Technology Directorate Department of Homeland Security
27	CAPT PETER NARDI, USN Major Program Manager for Naval Command & Control (IWS 6.0)

March

6	CAPT Tom Jones, USCG Commanding Officer, U.S. Coast Guard Research and Development Center CAPT John Macaluso, USCG Chief, Research and Development Office
9	Ms. Lana Atwell Oversight Executive, Advanced Systems & Concepts (Interoperability & Network Centric Warfare) Office of Deputy Under Secretary of Defense
20	RADM David Venlet, USN Program Executive Officer, Tactical Air Programs
28	RADM (S) Michael Bachmann, USN Commander, Space and Naval Warfare Systems Command RDML Tim Flynn Vice Commander
29	RADM Stephen E. Johnson, USN Commander, Naval Undersea Warfare Center/ Prospective Director for Strategic Systems Programs

April

5	COMMODORE Gerald Christian, RAN Naval Attache, Embassy of Australia, Washington
12	COL John Coleman, USMC Commanding Officer, Marine Corps Base Camp Pendleton CAPT James Neushul, USMC Communications Officer
18	RADM(S) John Bird, USN Commander, Submarine Group SEVEN

21	RADM(s) Michael Bachmann, USN Commander, Space and Naval Warfare Systems Command
	RDML Tim Flynn, USN Vice Commander, Space and Naval Warfare Systems Command
24-25	Ms. Linda Newton Deputy Chief of Staff Command, Control, Communications, Computers and Intelligence United States Pacific Fleet
25	VADM Barry Costello, USN Commander, THIRD Fleet
	CAPT Carl Wallstedt, USN J6
	CAPT Pete Smith, USN, J6
	CAPT Randall Hauke, USN, J9
25	Mr. Vernon Bettencourt Assistant Chief Information Officer, United States Army

May

9	COL James Haywood, USAF Director, Space Superiority Systems Wing Space & Missile Systems Center
22	RADM Michael Bachmann, USN Commander, Space and Naval Warfare Systems Command
30	COL Jennifer Napper, USA Director, Command, Control, Communications & Computers System Directorate (J6) U.S. Pacific Command
31	Mr. Tom Modly Deputy Under Secretary of Defense for Financial Management Office of the Under Secretary of Defense (Comptroller)

June

6	RDML John "Clarke" Orzanlli, USN Deputy Director, Fleet Readiness Division (N43B) Office of the Chief of Naval Operations
	Mr. Greg Fogarty Logistics & Materiel Readiness Office of the Under Secretary of Defense
12-13	CAPT Thomas Ward, USN Branch Head, FORCEnet, (OPNAV N81F) Office of the Chief of Naval Operations
21	Dr. Delores Etter ASN RD&A

Dr. Gary Federici
DASN C4I/SPACE

22   CAPT Micheal Galpin, USN
            Deputy Director, Joint Interagency Task Force South

22   Dr. Gary Federici
            Deputy Assistant Secretary of the Navy (C4I & Space)
            Office of the Assistant Secretary of the Navy

28   CAPT Alexander Butterfield, USN
            Commander, Office of Naval Intelligence

29   Mr. Joshua Hartman
            Professional Staff Member, House Appropriations Committee
            Subcommittee on Defense (HAC-D)
            United States House of Representatives

July

12   Mr. Kishore Swaminathan
            Senior Executive, Systems Integration Research Lead

13   Mr. Thomas Blann
            Deputy Director, Naval Warfare & Net-Centric Systems
            Directorate, Operational Test & Evaluation (DOT&E)
            Office of the Secretary of Defense

17   Dr. Michael McGrath
            Deputy Assistant Secretary of the Navy, (RDT&E)
            Office of the Assistant Secretary of the Navy (RD&A)

20   CAPT Dawn Maskell, USN
            Assistant Chief of Staff, Strategic Plans & Policy
            Commander, Carrier Strike Group Eleven

August

1   Mr. Donald Diggs
            Director for Command and Control Policy
            Office of the Secretary of Defense (Networks and Information Integration)

1   Dr. Allen Moshfegh
            Program Manager, Information Exploitation Office (IXO)
            Defense Advanced Research Projects Agency

9   RDML Garland Wright Jr., USN
            Deputy Commander, Maritime Operations Center/ Deputy
            Joint Force Maritime Component Commander

16   Ms. Darlene J. Costello
            Deputy Director, Naval Warfare
            Office of the Undersecretary of Defense (AT&L)/
            Deputy Undersecretary of Defense (A&T)/Portfolio Systems Acquisition

29	VADM Walter Davis, USN, RET
	VADM Edward Moore, USN, RET
	VADM John Nyquist, USN, RET
	VADM David Richardson, USN, RET
	RADM John Batzler, USN, RET
	RDML Bruce Boland, USN, RET

September

5-6   Mr. Phil Thompson
Program Manager, Special Operations Forces Digital Environment Programs

20   VADM Mark Edwards, USN
Deputy Chief of Naval Operations for Communications Networks
Office of the Chief of Naval Operations

RADM Kenneth Deutsch, USN
Director, Net- Centric Warfare (N83)

CAPT Nancy Deitch, USN
Head, Strategic Planning Division

CAPT Jerry Leugers, USN
Head, Programming Division

October

3   RDML Lee Metcalf, USN
Director, Integration & Augmentation (N3/N51)
Office of the Chief of Naval Operations

4-5   Dr. Joseph Lawrence, III
Director of Transition, Office of Naval Research

16   Dr. Patricia Gruber
Director of Research, Office of Naval Research

17   Mr. David Morriss
Professional Staff Member/Counsel, Armed Services Committee
United States Senate

RDML James Symonds, USN
Director, Environmental Protection, Safety, and Occupational Health
Office of the Chief of Naval Operations

20   GEN Shih-Chang Chaou
Vice Chief of the General Staff (Army)
Ministry of National Defense of the Republic of China

23   The Honorable Dr. James Finley
Deputy Undersecretary of Defense for Acquisition & Technology
Office of the Undersecretary of Defense

November

15	RDML Victor See USN Program Executive Officer, Program Executive Office for Space Systems/ Commander Space & Naval Warfare Systems Command Space Field Activity Director, Communications Directorate National Reconnaissance Office
29	Ms. Susan Alexander Chief Technology Officer for Information & Network Assurance Networks & Information Integration Office Office of the Assistant Secretary of Defense

December

5	CAPT Tim Davison, USN Acting Commander/Chief of Staff Naval Warfare Development Command
12	RADM Tom Kilcline, Jr., USN Prospective COMNAVAIRPAC/Director, Warfare Integration/ Senior National Representative, N8F Office of the Chief of Naval Operations

APPENDIX D: CY 2006 MAJOR CONFERENCES AND MEETINGS

January

30–3 (Feb)	The Technical Cooperation Program C3I Group TPI Meeting

February

15	MITRE Board of Trustees Meeting
28–1 (Mar)	Program Executive Office for C4I & Space & Aegis Ballistic Missile Defense In Progress Review

March

9	International Test & Evaluation Association Greater San Diego Chapter Meeting
28–30	Deployable Autonomous Distributed System (DADS) Passive Barrier Demonstration

April

25–27 April	Armed Forces Communications & Electronics Association Joint C4ISR Symposium

May

3	Electromagnetic Windows Symposium
10–11	Active Conceptual Modeling of Learning Workshop
10–12	Network–Enabled Command Capability Meeting
20	Space and Naval Warfare Systems Center San Diego Open House

June

21	SSC San Diego All Hands with The Honorable Delores Etter, ASN, RD&A
12–23	Naval Research Advisory Committee Summer Study Meeting

July

17–21	23rd United Kingdom/United States Communication Symposium

October

18–19   Oct 3rd Annual Joint Chat Systems Conference

November

2   Enterprise Echelon II Brief *Team SPAWAR* Enabler/Provider Review Meeting

APPENDIX E: ACRONYMS

aADNS	Airborne Automated Digital Network System
ACDS	Advanced Combat Direction System
ADCAP	Advanced Capability Processor
ADNS	Advanced Digital Network System
AESA	Active Electronically Scanned Array
AIS	Automatic Identification Server
AIS	Automatic Identification System
ATO	Air Tasking Order
ATRV	All Terrain Robotic Vehicle
AUV	Autonomous Underwater Vehicle
BCI, Inc	Basic Commerce Industries, Incorporated
BMDS	Ballistic Missile Defense System
BRAC	Base Closure and Realignment
BTS	BMDS Test Bed, San Diego
C3	Command, Control, and Communication
C3D	Command, Control, Communications and Display
C4I	Command, Control, Communications, Computers and Intelligence
C4ISR	Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance
CASM	Communications Assets Survey and Mapping
CBRN	Chemical, Biological, Radiological, and Nuclear
CCA	Circuit Card Assembly
CDLMS	Common Data Link Management System
CENTRIXS	Combined Enterprise Regional Information Exchange Systems-Maritime
CFn	Composeable FORCEnet
CGIAS	Coast Guard Integrated Anti-Swimmer System
CMMI	Capability Maturity Model Integration
CNO	Chief of Naval Operations
CTF	Combined Test Force
CY	Calendar Year

DADS	Deployable Autonomous Distributed System
DoD	Department of Defense
DT	Development Test
ENVVEST	Environmental Investment
EODTECHDIV	Explosive Ordnance Disposal Technical Division
EPA	Environmental Protection Agency
EPLRS	Enhanced Position Location Reporting System
EPLRS-DR	EPLRS Data Radio
ERP	Enterprise Resource Planning
FTM	Flight Test Mission
FY	Fiscal Year
GCCS-M	Global Command and Control System-Maritime
GDFS	Graphical Data Fusion System
GIG-E	Gigabit Ethernet
GIG-EF	Global Information Grid-Evaluation Facilities
GPS	Global Positioning System
HENAAC	Hispanic Engineer National Achievement Award
HULS	Hull Unmanned Underwater Vehicle Localization System
HWDDC	Hazardous Weather Detection and Display Capability
IAS	Integrated Anti-Swimmer System
ICTAP	Interoperable Communications Technical Assistance Program
IPT	Integrated Product Team
IS	Information Systems
ISEA	In-Service Engineering Activity
ISR	Intelligence, Surveillance, and Reconnaissance
JAUS	Joint Architecture for Unmanned Systems
JDN	Joint Data Network
JEM	Joint Effects Model

JMPS	Joint Mission Planning System
JPEO-CBD	Joint Program Executive Office for Chemical and Biological Defense
JPM IS	Joint Project Manager Information Systems
MDA	Missile Defense Agency
MDARS-E	Mobile Detection Assessment Response System-Exterior
MDSE	Missile Defense System Exerciser
MESA	Mathematics, Engineering, and Science Achievement
METOC	Meteorology and Oceanography
MITS	Multi-Influence Tripwire System
MIUW	Mobile Inshore Undersea Warfare
MOCU	Multi-Robot Operator Control Unit
NAVSSI	Navigation Sensor System Interface
NCTSI	Navy Center for Tactical Systems Interoperability
NMCI	Navy Marine Corps Intranet
NRI	NTDS Range Interface
NTDS	Navy Tactical Data System
PAO	Public Affairs Officer
PCBs	Polychlorinated Biphenyls
PEO	Program Executive Officer
PI	Processing Improvement
PMRF	Pacific Missile Range Facility
PSNS&IMF	Puget Sound Naval Shipyard and Intermediate Maintenance Facility
RAAMP	Range Architecture Adaptable Message Processor
RAIT	Range Interface ACDS Translator
RF	Radio Frequency
RFID	Radio Frequency Identification
RIMPAC	Rim of the Pacific
RNOSC	Regional Network Operations and Security Center
ROCC	Robotic Operations Command Center

SCAMPI	Standard CMMI Appraisal Method for Process Improvement
SEPO	Systems Engineering Process Office
SPAWAR	Space and Naval Warfare Systems Command
SPI	Software Process Improvement
SPINS	Special Instructions
SSA	Software Support Agency
SSC San Diego	Space and Naval Warfare Systems San Diego
SSF	SPAWAR Systems Facility
TADIL	Tactical Digital Information Link
TAMPS	Tactical Automated Mission Planning System
TCS	Tactical Communication Solutions
TEPS	Tactical Emulator Peripheral Systems
TFNF	Task Force Navy Family
TRANSDEC	Transducer Evaluation Center
U.S.	United States
UAV	Unmanned Aerial Vehicle
UGV	Unmanned Ground Vehicle
URBOT	Urban Robot
USCG	U.S. Coast Guard
USV	Unmanned Surface Vehicle
VLF/LF	Very Low Frequency/Low Frequency

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[1] *Outlook*, "New Code 250 established in Hawaii, Guam, and Japan," 24 March 2006, Volume 29, Number 6

[2] SSC San Diego, "End of Year (EOY) 2006 Financial Brief," presented at the National Defense Industrial Association (NDIA) by Carmela Keeney, Executive Director, SSC San Diego, 23 January 2007

[3] *Outlook*, "Farewell to Executive Officer Capt. Mark Kohlheim," 1 December 2006, Volume 29, Number 22

[4] *Outlook*, "SSC San Diego Public Affairs Officer Tom LaPuzza retires," 19 May 2006, Volume 29, Number 9

[5] *Outlook,* "Jim Fallin named Director of Communications and PAO," 3 November 2006, Volume 29, Number 20

[6] *Outlook*, "George McCarty is new Code 250 department head," 17 November 2006, Volume 29, Number 21

[7] *Outlook*, "Pat Sullivan heads Code 270," 2 June 2006, Volume 29, Number 10

[8] *Outlook*, "Tammy Sanchez heads Supply and Contracts Department," 25 August 2006, Volume 29, Number 16

[9] *Outlook*, "Rita Mireles is new SSC San Diego Director of Security," 5 May 2006, Volume 29, Number 8

[10] *Outlook*, "Base Closure and Realignment (BRAC) execution postponed," 10 February 2006, Volume 29, Number 3

[11] *Outlook*, "BRAC implementation developments announced," 26 January 2007, Volume 30, Number 2

[12] *Outlook*, "The 2006 Organizational Survey is coming!," 10 February 2006, Volume 29, Number 3, *Outlook*, "Input your thoughts for organizational improvement," 24 February 2006, Volume 29, Number 4, *Outlook*, "Organizational Survey 2006: The results are in!," 2 June 2006, Volume 29, Number 10, Burnkrant, Steven R., Ph.D., 24 April 2006, "Results of the 2006 Organizational Assessment Survey, SPAWAR SSC-SD," Division for Human Resource Products & Services, U.S. Office of Personnel Management

[13] *Outlook*, "New committee chartered for process improvement," 3 November 2006, Volume 29, Number 20

[14] Executive Director/Commanding Officer All-Hands email, 18 December 2006

[15] *Outlook*, "SSC San Diego hosts Mastering Process Improvement class," 22 September 2006, Volume 29, Number 17

[16] *Outlook*, "Process improvement training held in Yokosuka, Japan," 20 October 2006, Volume 29, Number 19

[17] *Outlook*, "100 years of Navy communications on Point Loma," Outlook, 24 March 2006, Volume 29, Number 6, *Outlook*, "SSC San Diego will hold open house and Fiesta Picnic on May 20," Outlook, 21 April 2006, Volume 29, Number 7, *Outlook*, "Open House! Center staff, families, and friends invited," 5 May 2006, Volume 29, Number 8, *Outlook*, "Open House: SSC San Diego celebrates an illustrious 66-year history of science and technology," Outlook, 19 May 2006, Volume 29, Number 9, *Outlook*, "Open House: SSC San Diego tours: Topside," 19 May 2006, Volume 29, Number 9, *Outlook*, "Open House: SSC San Diego tours: Bayside," 19 May 2006, Volume 29, Number 9, *Outlook*, "Open House: SSC San Diego tours: Model Range and Seaside,," 19 May 2006, Volume 29, Number 9, *Outlook*, "Open House: History of Navy Radio in San Diego.", 19 May 2006, Volume 29, Number 9, Outlook, "SSC San Diego Open House and Fiesta Picnic a huge success," 2 June 2006, Volume 29, Number 10

[18] *Outlook*, "Historical perspectives," 28 July 2006, Volume 29, Number 14, *Outlook*, "SSC San Diego exhibits at the Point Loma Public Library," 11 August 2006, Volume 29, Number 15, *Outlook*, "This is the last week of the Point Loma Library show!," 25 August 2006, Volume 29, Number 16

19 Outlook, "SSC San Diego hosts the Ninth International Autonomous Underwater Vehicle Competition, 3-6 August," 28 July 2006, Volume 29, Number 14, Outlook, "Florida Gators take first place at International AUV Competition," 25 August 2006, Volume 29, Number 16

[20] *Outlook*, "Burmeister and Larson present robotics technology at Ed Tech Fair," 5 May 2006, Volume 29, Number 8

[21] Outlook, "Center personnel mentor students for Shadow Day," 10 March 2006, Volume 29, Number 5

[22] Executive Director/Commanding Officer All-Hands email, 18 December 2006

[23] *Outlook*, "Meeting the challenge of harbor defense," 24 February 2006, Volume 29, Number 4

[24] *Outlook*, "REEFEX team facilitates USS Oriskany's 'new career'," 19 May 2006, Volume 29, Number 9

[25] SSC San Diego's report, "Ex-Oriskany Artificial Reef Project: Ecological Risk Assessment," is posted on the Environmental Protection Agency (EPA) website: http://www.epa.gov/region4/air/lead/PCBWebPage.htm

[26] *Outlook*, "Code 2375 plays significant role with ENVVEST Project," 22 September 2006, Volume 29, Number 17

[27] *Outlook*, "ROBART III is in the news," 24 February 2006, Volume 29, Number 4. See *Outlook* article for historical information.

[28] *Outlook*, "Center conducts historic unmanned systems demonstration," 24 March 2006, Volume 29, Number 6

[29] Executive Director/Commanding Officer All-Hands email, 18 December 2006; SSC San Diego *Outlook—*see footnotes below.

[30] *Outlook*, "PM IS achieves CMMI Level 2," 6 October 2006, Volume 29, Number 18

[31] *Outlook*, "TEAM SPAWAR supports Ballistic Missile Defense System development for MDA 14 July 2006," Volume 29, Number 13

[32] *Outlook*, "Missile Defense Team completes significant phase of testing," 14 July 2006, Volume 29, Number 13

[33] *Outlook*, "Center builds Range Architecture Adaptable Message Processor," 6 October 2006, Volume 29, Number 18

[34] *Outlook*, "SSC San Diego Philadelphia Detachment deploys new system for Royal Australian Air Force," 25 August 2006, Volume 29, Number 16

[35] *Outlook*, "Joint Mission Planning Support Office provides new software for F-18 E/F training," 1 December 2006, Volume 29, Number 22

[36] *Outlook*, "Joint Effects Model improves emergency response," 21 April 2006, Volume 29, Number 7

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